2007 TRANSMISSION

Manual Transmission - Tremec 6-Speed - Corvette

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Adapter Plate Plug	27 N.m	20 lb ft
Adapter Plate to Transmission Case Bolts	48 N.m	36 lb ft
Backup Lamp Switch	27 N.m	20 lb ft
Computer Aided Gear Select Solenoid	40 N.m	30 lb ft
Cover Plate Bolts	20 N.m	15 lb ft
Extension Housing Plug	27 N.m	20 lb ft
Extension Housing to Transmission Case Bolts	48 N.m	36 lb ft
Neutral Return Cam Spring Retaining Bolt	25 N.m	18 lb ft
Reverse Idler Shaft Bracket Bolts	25 N.m	18 lb ft
Reverse Lockout Assembly Bolt	18 N.m	13 lb ft
Reverse Lockout Solenoid	40 N.m	30 lb ft
Shift Detent Assembly	40 N.m	30 lb ft
Shift Guide Plate Bolts	22 N.m	16 lb ft
Shift Lever Guide Bolts	27 N.m	20 lb ft
Temperature Switch (MZ6/MM6 Z06)	41 N.m	30 lb ft
Transmission Case Drain Plug	18 N.m	13 lb ft
Transmission Case Fill Plug	18 N.m	13 lb ft
Transmission Pump to Front Adapter Bolt	18 N.m	13 lb ft

SEALERS, ADHESIVES, AND LUBRICANTS

Sealers, Adhesives, and Lubricants

Application	Type Of Material	GM Part Number	
		United States	Canada
Adapter Plate Plug (MM6 Only)	Sealant	12346004	10953480

Cover Plate	Sealant	12345739	10953472
Extension Housing Bolts	Sealant	12346004	10953480
Reverse Idler Shaft Bracket Bolts	Threadlock	12345382	10953489
Reverse Lamp Switch	Sealant	12346004	10953480
Shift Lever Guide Bolts	Sealant	12346004	10953480
Temperature Switch (MZ6/MM6 Z06)	Sealant	12346004	10953480
Transmission Case Drain Plug	Sealant	12346004	10953480
Transmission Case to Adapter Plate Mating Surface	Sealant	12345739	10953472
Transmission Fluid	Lubricant	88861800	88861801

LUBRICATION SPECIFICATIONS

Lubrication Specifications

Application	Metric	English
Manual Transmission Fluid GM P/N 88861800 (Canadian P/N 88861801)		
Base	3.46 liters	3.65 quarts
Z51	3.96 liters	4.18 quarts
Z06	4.28 liters	4.52 quarts

SHIM SIZE SPECIFICATIONS

Shim Size Specifications

Application	Specification	
Metric	English	
Countershaft Extension Shim Axial Play	0.05-0.13 mm	0.002-0.005 in
Countershaft Shim Preload	0.0-0.05 mm	0.0-0.002 in
Input Shaft/Mainshaft Shim Preload	0.0-0.05 mm	0.0-0.002 in

SCHEMATIC AND ROUTING DIAGRAMS

MANUAL TRANSMISSION SCHEMATIC ICONS

Manual Transmission Schematic Icons

Icon	Icon Definition
	IMPORTANT: **Twisted-pair wires provide an effective "shield" that helps protect sensitive electronic**

components from electrical interference. If the wires were covered with shielding, install new shielding. Refer to Splicing Twisted or Shielded Cable in Wiring Systems.
In order to prevent electrical interference from degrading the performance of the connected components, you must maintain the proper specification when making any repairs to the twisted-pair wires shown :

- **The wires must be twisted a minimum of 9 turns per 31 cm (12 in) as measured anywhere along the length of the wires**
- **The outside diameter of the twisted wires must not exceed 6.0 mm**

MANUAL TRANSMISSION SCHEMATICS

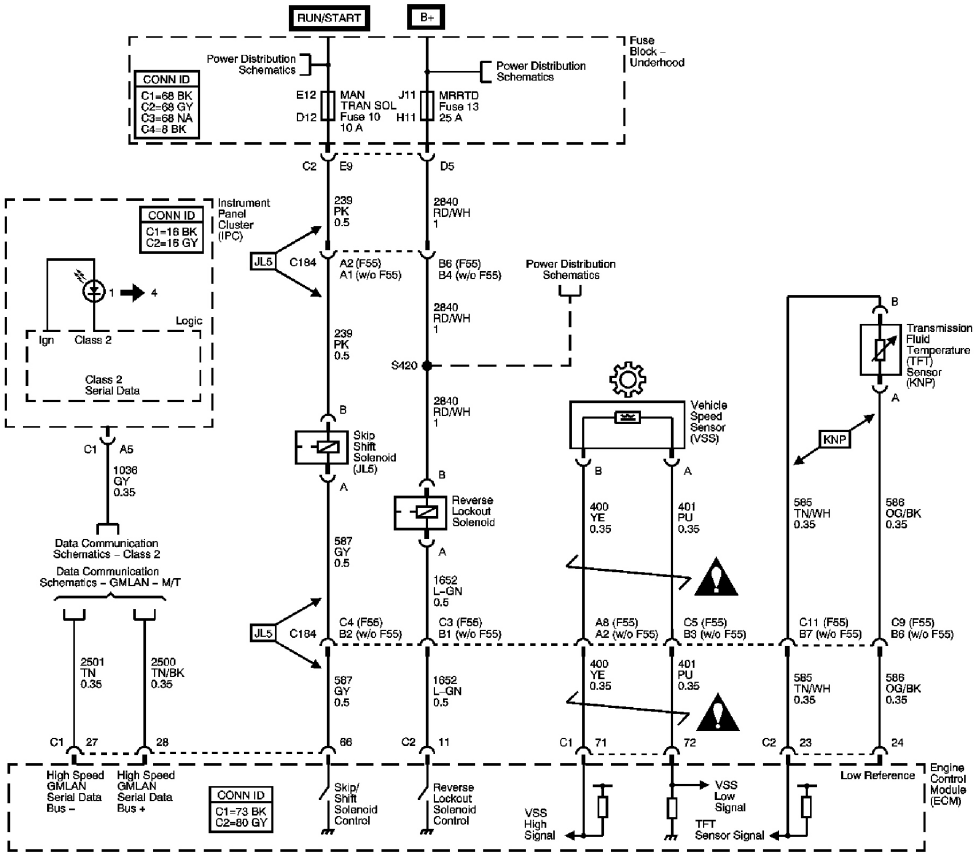


Fig. 1: Manual Transmission Schematic
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

MANUAL TRANSMISSION COMPONENT VIEWS

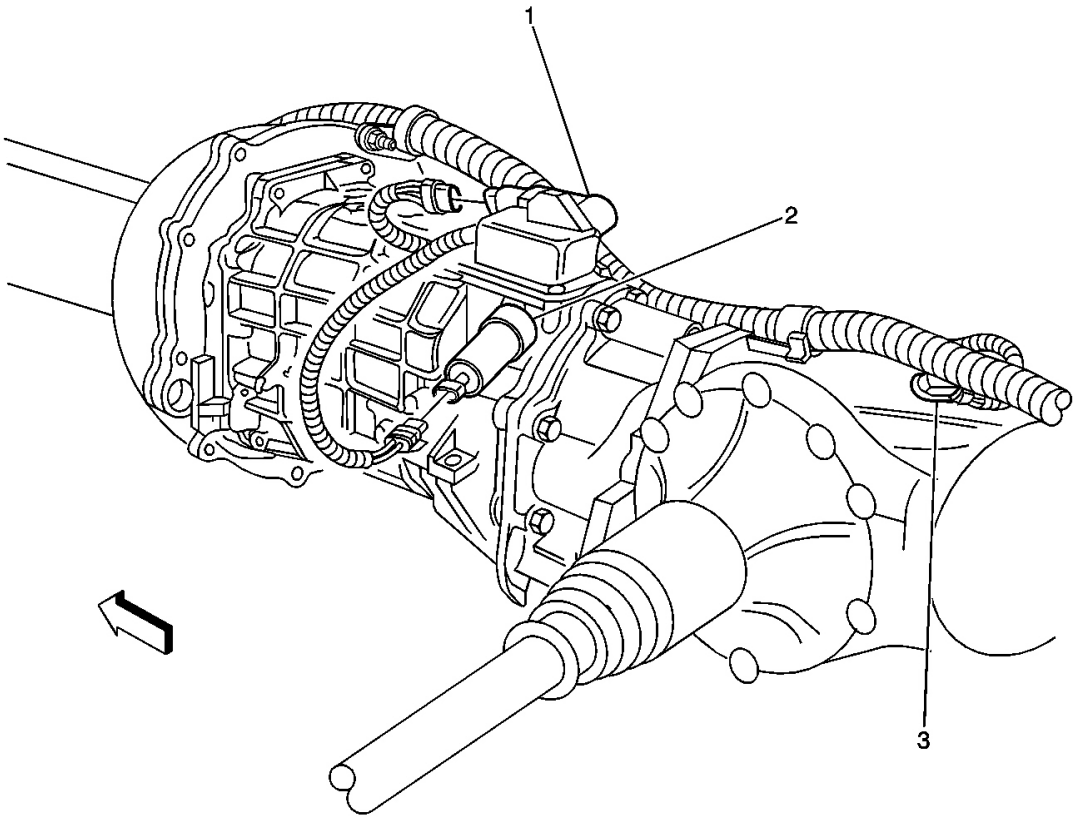


Fig. 2: Manual Transmission Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 2

Callout	Component Name
1	Reverse Inhibit Solenoid
2	Skip Shift Solenoid
3	Vehicle Speed Sensor (VSS)

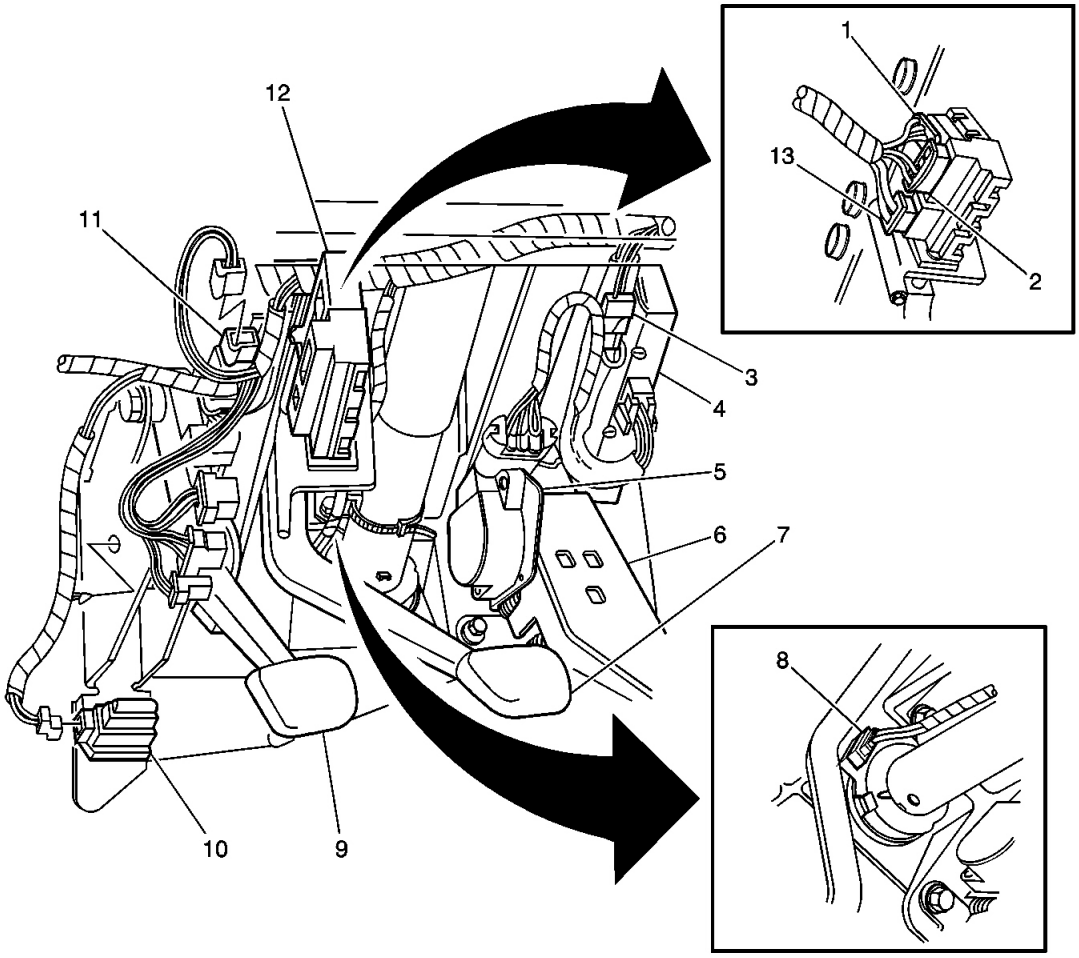


Fig. 3: Under Side Of The Dash Component View - Left
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 3

Callout	Component Name
1	Stop Lamp Switch C1
2	Stop Lamp Switch C3
3	C213
4	Bose Signal Processor
5	Accelerator Pedal Position (APP) Sensor
6	Accelerator Pedal
7	Brake Pedal
8	Steering Wheel Position Sensor

9	Clutch Pedal
10	Clutch Pedal Start Switch
11	Clutch Pedal Position Switch
12	Stop Lamp Switch
13	Stop Lamp Switch Connector C2

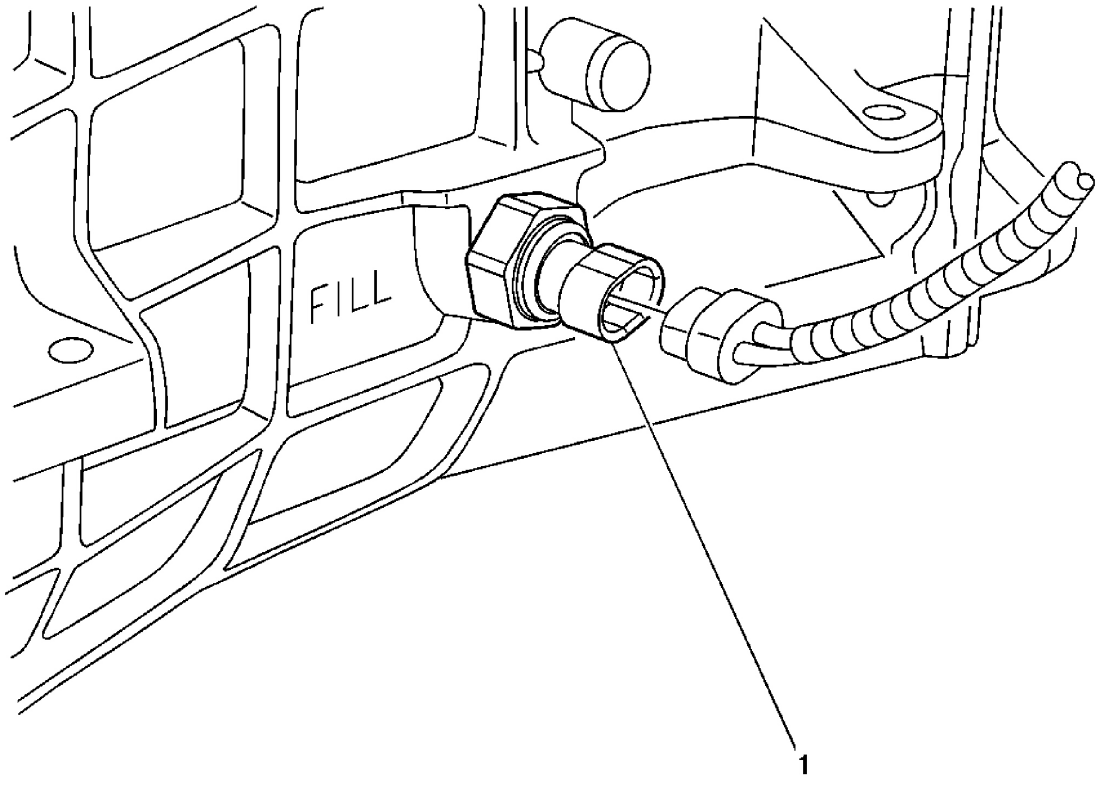


Fig. 4: Left Side Of The Transmission Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 4

Callout	Component Name
1	Transmission Fluid Temperature (TFT) Sensor

TRANSMISSION COMPONENT LOCATION

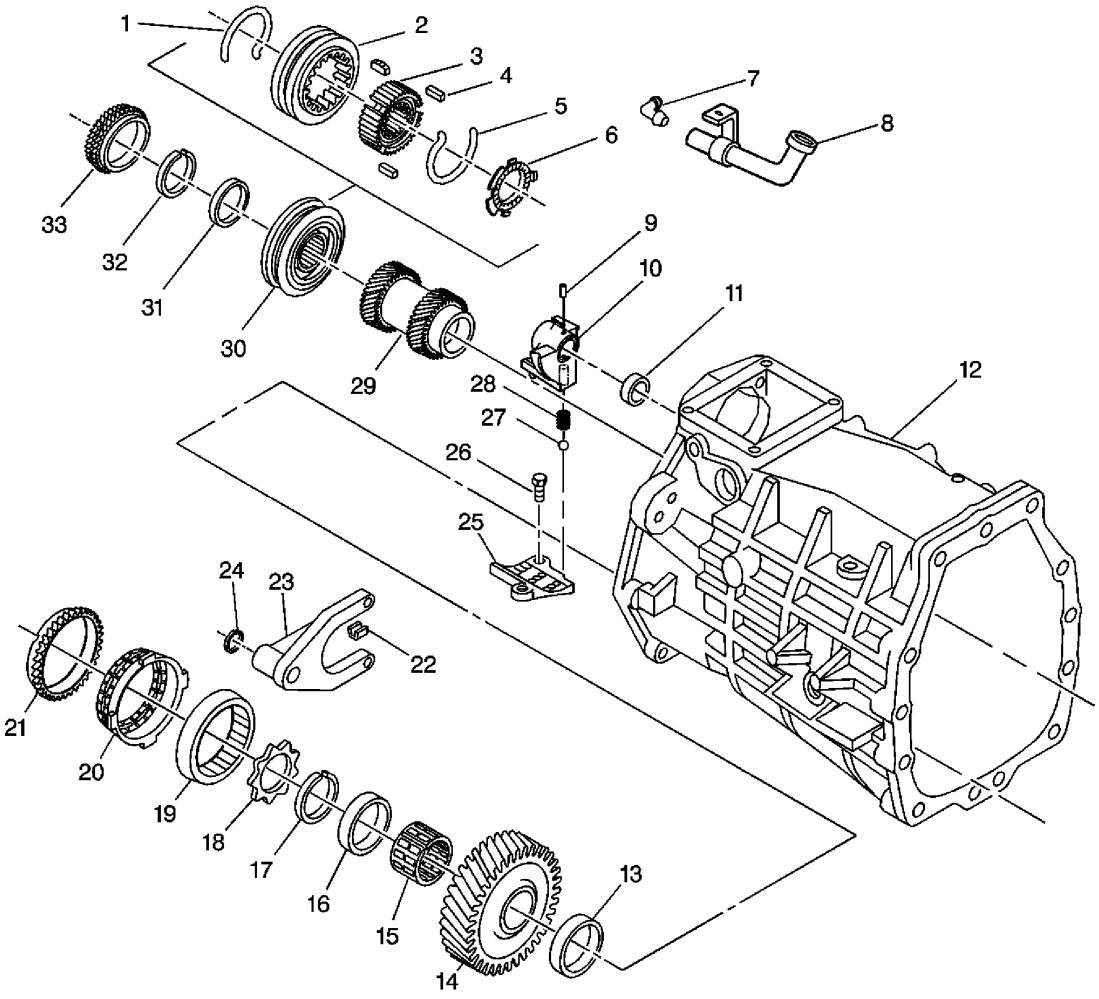


Fig. 5: Transmission Case Component Location (1 of 2) - Y Car
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 5

Callout	Component Name
1	Reverse Synchronizer Spring
2	Reverse Synchronizer Sleeve
3	Reverse Synchronizer Hub
4	Reverse Synchronizer Key
5	Reverse Synchronizer Spring
6	Reverse Synchronizer Key Retainer
7	Vent
8	Vent Pipe

9	Offset Lever Roll Pin
10	Offset Shift Lever
11	Top Shift Shaft Bushing
12	Transmission Case
13	6th Speed Drive Gear Bearing Spacer
14	6th Speed Drive Gear
15	6th Speed Drive Gear Needle Bearing
16	6th Speed Drive Gear Bearing Spacer
17	Synchronizer Retainer Ring
18	6th Speed Drive Gear Thrust Washer
19	6th Speed Drive Gear Inner Cone
20	6th Speed Drive Gear Friction Cone
21	6th Speed Drive Gear Synchronizer Blocking Ring
22	Reverse Shift Fork Pad
23	Reverse Shift Fork
24	Reverse Shift Fork Retainer Ring
25	Guide Plate
26	Guide Plate Bolt
27	Shift Detent Ball
28	Shift Detent Ball Spring
29	5th and 6th Speed Driven Gear
30	Reverse Synchronizer Hub and Sleeve
31	Reverse Gear Thrust Washer
32	Reverse Synchronizer Retainer Ring
33	Reverse Synchronizer Blocking Ring

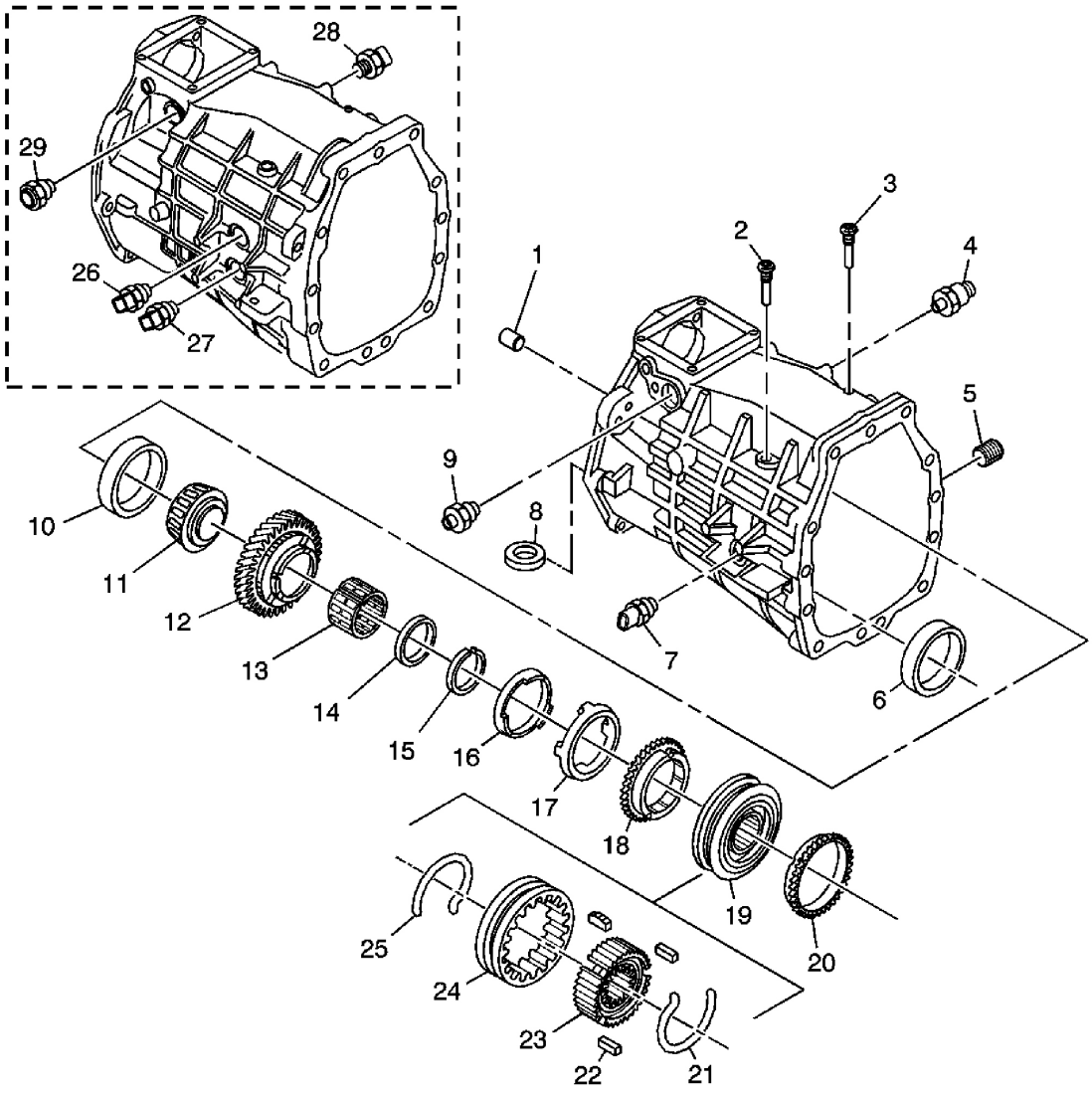


Fig. 6: Transmission Case (2 of 2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 6

Callout	Component Name
1	Case Rear Extension Pin
2	5th/6th Lever Guide Bolt
3	Interlock Guide Bolt
4	Computer Aided Gear Select Solenoid
5	Oil Fill Plug (MM6 Only)
6	Countershaft Bearing Race

7	Backup Lamp Switch
8	Magnet
9	Shift Detent Assembly
10	Mainshaft Rear Bearing Race
11	Mainshaft Rear Bearing
12	1st Speed Drive Gear
13	1st Speed Drive Gear Needle Bearing
14	1st Speed Drive Gear Bearing Spacer
15	Synchronizer Retainer Ring
16	1st Speed Drive Gear Inner Cone
17	1st Speed Drive Gear Friction Cone
18	1st Gear Synchronizer Blocking Ring
19	1st/2nd Synchronizer Assembly
20	2nd Gear Synchronizer Blocking Ring
21	1st/2nd Synchronizer Spring
22	1st/2nd Synchronizer Key
23	1st/2nd Synchronizer Hub
24	1st/2nd Synchronizer Sleeve
25	1st/2nd Synchronizer Spring
26	Reverse Backup Lamp Switch (Export Only)
27	E-Z Key Switch (Export Only)
28	Coolant Temperature Sensor (Export Only)
29	Detent (Export Only)

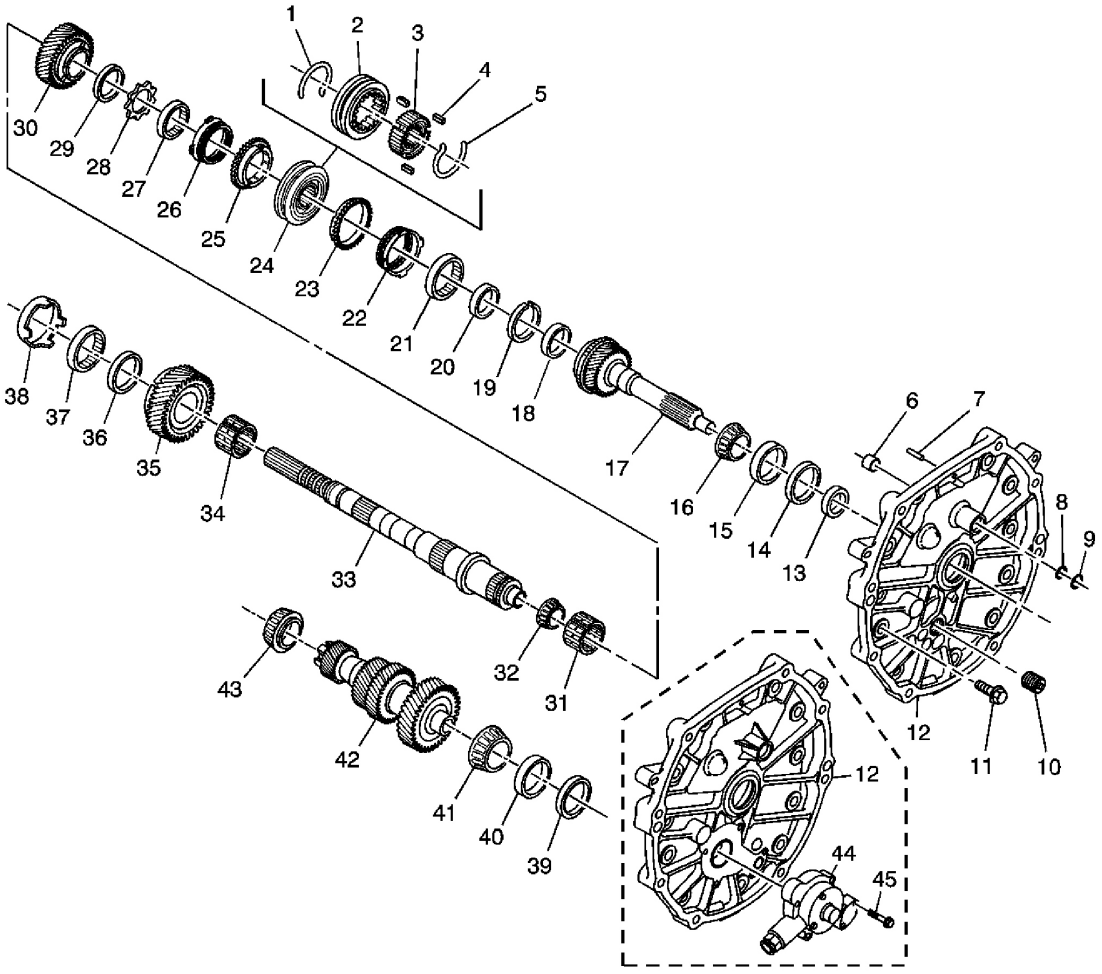


Fig. 7: Adapter Plate and Gears
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 7

Callout	Component Name
1	3rd/4th Synchronizer Spring
2	3rd/4th Synchronizer Sleeve
3	3rd/4th Synchronizer Hub
4	3rd/4th Synchronizer Key
5	3rd/4th Synchronizer Spring
6	Top Shaft Rail Bushing
7	Dowel Pin
8	Inner Shift Shaft Seal
9	Outer Shift Shaft Seal

10	Adapter Plate Inspection Plug
11	Adapter to Transmission Case Bolt
12	Front Adapter Plate
13	Input Shaft Seal
14	Input Shaft Bearing Shim
15	Input Shaft Bearing Race
16	Input Shaft Bearing
17	Input Shaft
18	Input Shaft Bearing Race
19	3rd/4th Synchronizer Retaining Ring
20	4th Speed Drive Gear Thrust Washer
21	4th Speed Drive Gear Inner Cone
22	4th Speed Drive Gear Friction Cone
23	4th Speed Drive Gear Blocker Ring
24	3rd/4th Synchronizer Assembly
25	3rd Speed Drive Gear Synchronizer Blocking Ring
26	3rd Speed Drive Gear Friction Cone
27	3rd Speed Drive Gear Inner Cone
28	3rd Speed Drive Gear Thrust Washer
29	3rd Speed Drive Gear Spacer
30	3rd Speed Drive Gear
31	3rd Speed Drive Gear Bearing
32	Mainshaft Small Tapered Bearing
33	Mainshaft
34	2nd Speed Drive Gear Needle Bearing
35	2nd Speed Drive Gear
36	2nd Speed Drive Gear Bearing Spacer
37	2nd Speed Drive Gear Inner Cone
38	2nd Speed Drive Gear Friction Cone
39	Countershaft Bearing Adjust Shim
40	Countershaft Bearing Race
41	Countershaft Front Bearing
42	Countershaft
43	Countershaft Rear Bearing
44	Auxiliary Cooler Pump (MZ6 Only)

	Auxiliary Cooler Pump Bolt (MZ6 Only)

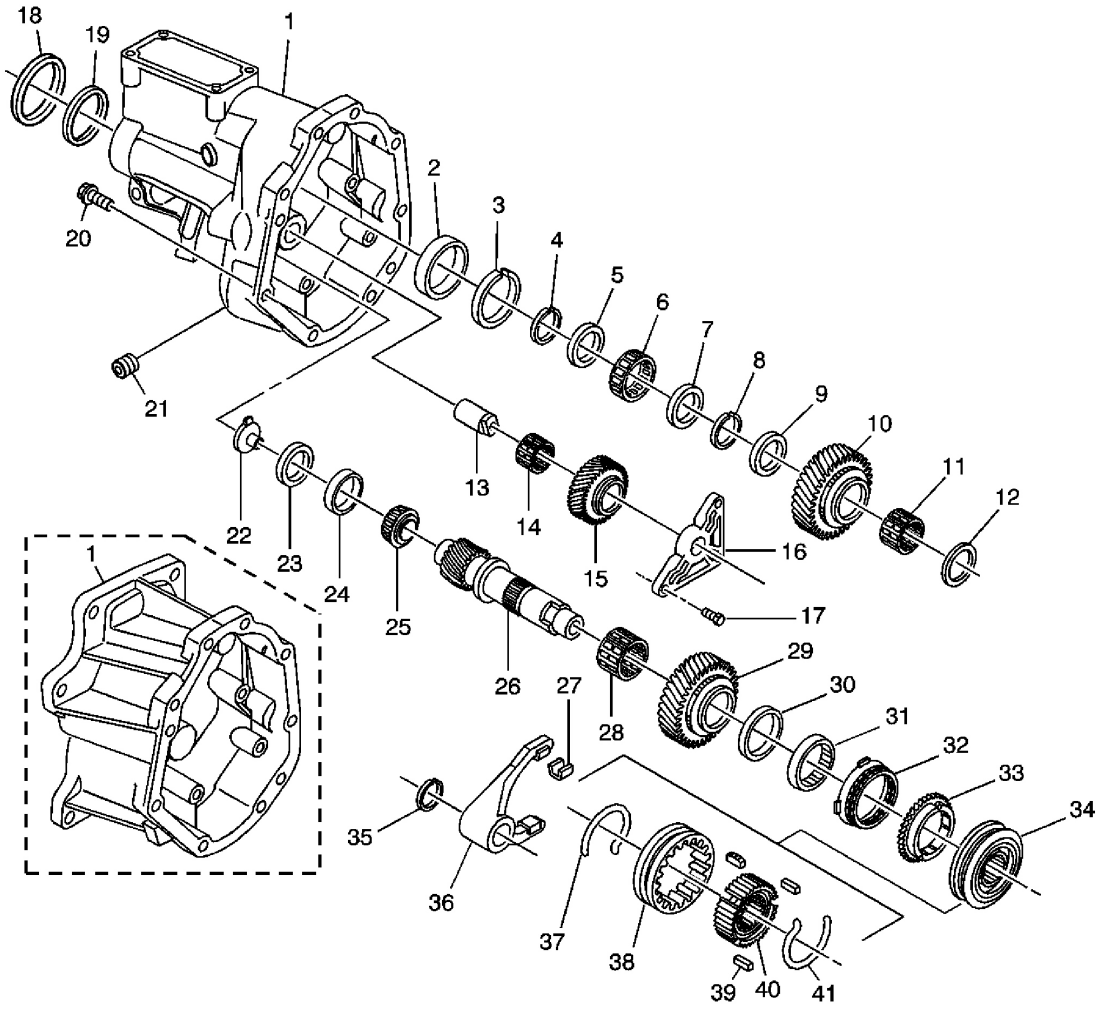


Fig. 8: Extension Housing
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 8

Callout	Component Name
1	Extension Housing
2	Mainshaft Bearing Race
3	Mainshaft Rear Bearing Retainer Ring
4	Mainshaft Rear Bearing Retainer Ring
5	Mainshaft Gear Bearing Spacer
6	Mainshaft Rear Bearing

7	Mainshaft Gear Bearing Spacer
8	Synchronizer Retainer Ring
9	Reverse Gear Thrust Washer
10	Mainshaft Reverse Speed Gear
11	Reverse Gear Bearing
12	Reverse Gear Washer
13	Reverse Idler Gear Shaft
14	Reverse Idler Gear Needle Bearing
15	Reverse Idler Gear
16	Reverse Idler Bracket
17	Reverse Idler Bracket Bolt
18	Outer Output Shaft Seal
19	Inner Output Shaft Seal
20	Extension Housing to Transmission Case Bolt
21	Oil Drain Plug
22	Lubrication Funnel
23	Front Countershaft Extension Bearing Shim
24	Countershaft Extension Bearing Race
25	Countershaft Extension Bearing
26	Countershaft Extension
27	Shift Fork Pad
28	5th Speed Drive Gear Needle Bearing
29	5th Speed Drive Gear
30	5th Speed Drive Gear Thrust Washer
31	5th Speed Gear Inner Cone
32	5th Speed Gear Friction Cone
33	5th Gear Synchronizer Blocking Ring
34	5th/6th Synchronizer Assembly
35	5th Gear Shift Fork Retainer Ring
36	5th/6th Shift Fork
37	5th/6th Synchronizer Spring
38	5th/6th Synchronizer Sleeve
39	5th/6th and Reverse Synchronizer Key
40	5th/6th Synchronizer Hub
41	5th/6th Synchronizer Spring

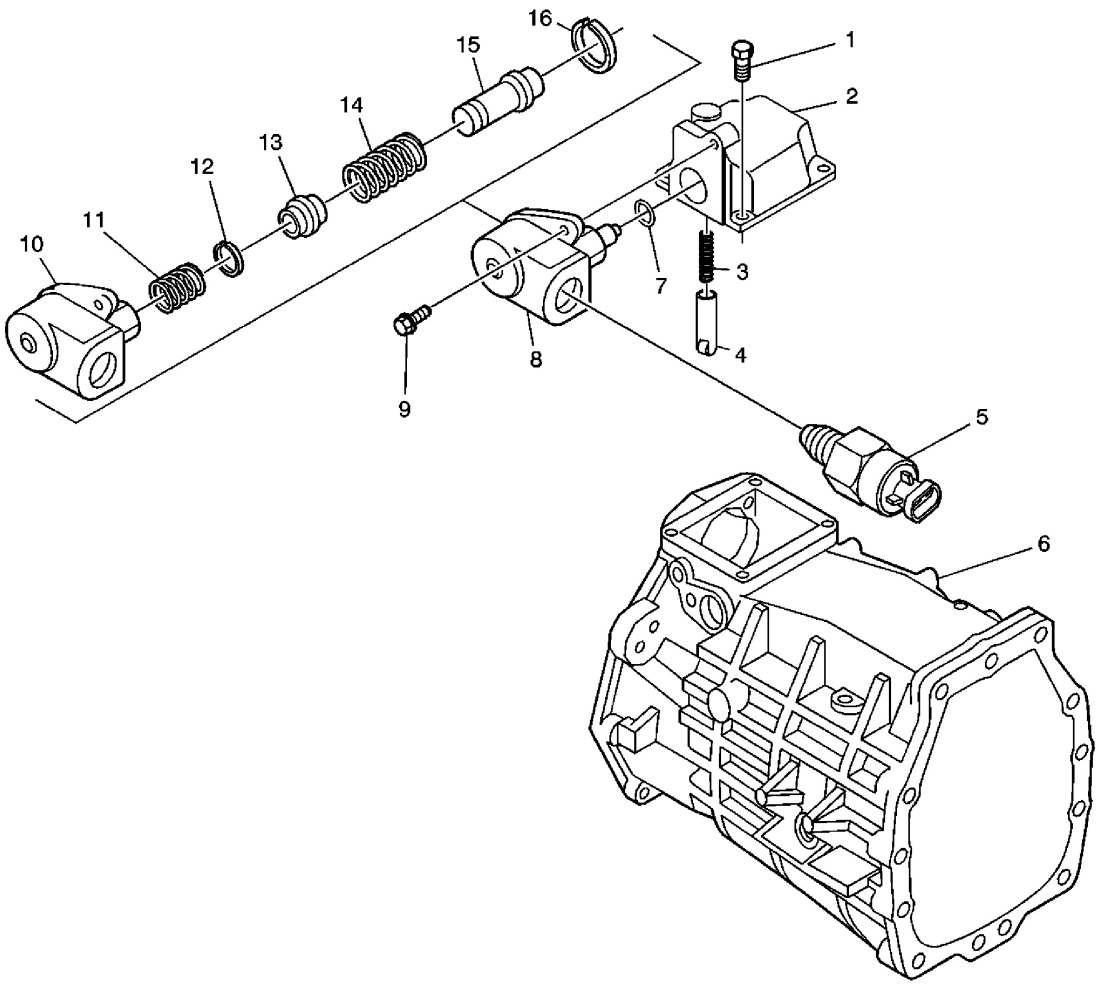


Fig. 9: Reverse Lockout
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 9

Callout	Component Name
1	Transmission Case Cover Bolt
2	Transmission Case Cover
3	Spring
4	Detent Roller
5	Reverse Lockout Solenoid
6	Transmission Case
7	O-ring
8	Reverse Lockout Assembly

9	Reverse Lockout Solenoid Mounting Bolt
10	Reverse Lockout Body
11	Reverse Lockout Inner Spring
12	Snap Ring
13	Reverse Lockout Collar
14	Reverse Lockout Outer Spring
15	Reverse Lockout Plunger
16	Snap Ring

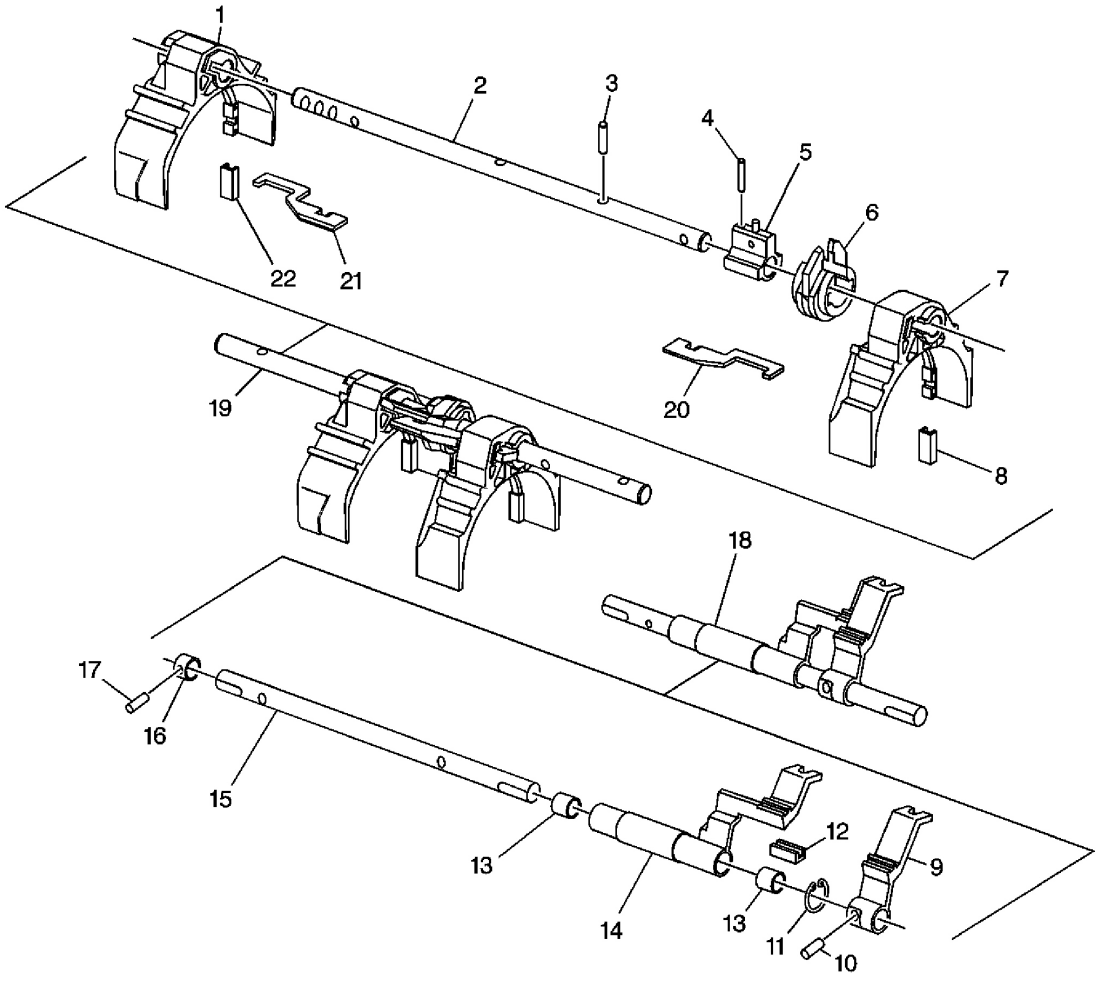


Fig. 10: Shift Shafts
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 10

Callout	Component Name

1	1st/2nd Shift Fork
2	Shift Shaft
3	Neutral Return Cam Pin
4	1st/2nd Shift Fork Pin
5	Control Select Arm Pin
6	Gear Select Interlock Plate
7	3rd/4th Shift Fork
8	3rd/4th Shift Fork Pad
9	Offset Shift Lever
10	Reverse Shift Lever Pin
11	Retaining Ring
12	5th/6th Shift Lever Pad
13	5th/6th Shift Shaft Lever Bushing
13	5th/6th Shift Shaft Lever Bushing
14	5th/6th Shift Lever
15	5th/6th Reverse Shift Shaft
16	Reverse Shift Collar
17	Reverse Shift Collar Pin
18	5th/6th Shift Lever Assembly
19	1st/2nd Shift Shaft Assembly
20	Shift Interlock Plate
21	Interlock Shift Plate
22	1st/2nd Shift Fork Pad

VISUAL IDENTIFICATION

MANUAL TRANSMISSION CONNECTOR END VIEWS

Clutch Pedal Switch

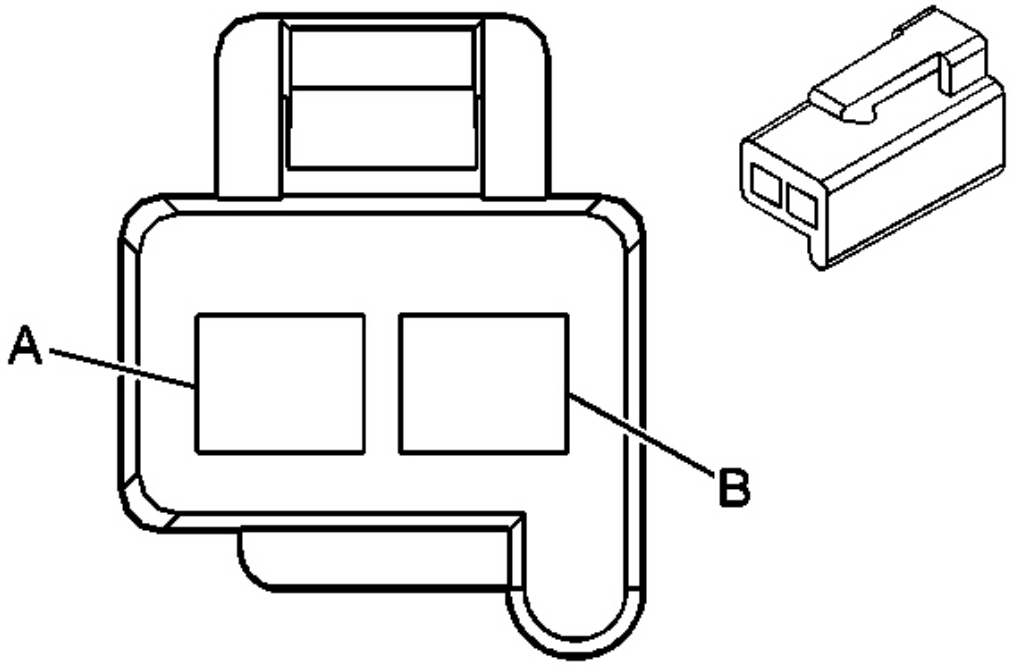


Fig. 11: Clutch Pedal Switch Connector End View
Courtesy of GENERAL MOTORS CORP.

Clutch Pedal Switch Connector Parts Information

Connector Part Information

- OEM: 12041433
- Service: -
- Description: 2-Way F Metri-Pack 280 Series (BK)

Clutch Pedal Switch Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	GY	48	CPP Switch Signal
B	PK	1039	Ignition 1 Voltage

Reverse Inhibit Solenoid (JLS)

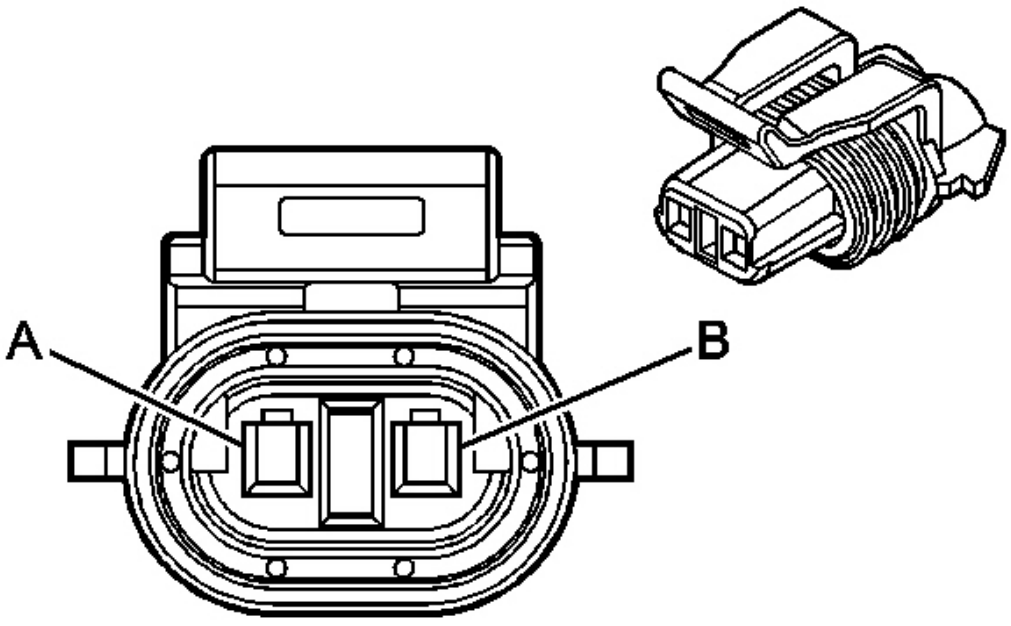


Fig. 12: Reverse Inhibit Solenoid (JLS) Connector End View
Courtesy of GENERAL MOTORS CORP.

Reverse Inhibit Solenoid (JLS) Connector Parts Information

Connector Part Information

- OEM: 12052646
- Service: -
- Description: 2-Way F Metri-Pack 150 Series (WH)

Reverse Inhibit Solenoid (JLS) Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	L-GN	1652	Reverse Lockout Solenoid Control
B	RD/WH	2840	Battery Positive Voltage

Skip Shift Solenoid

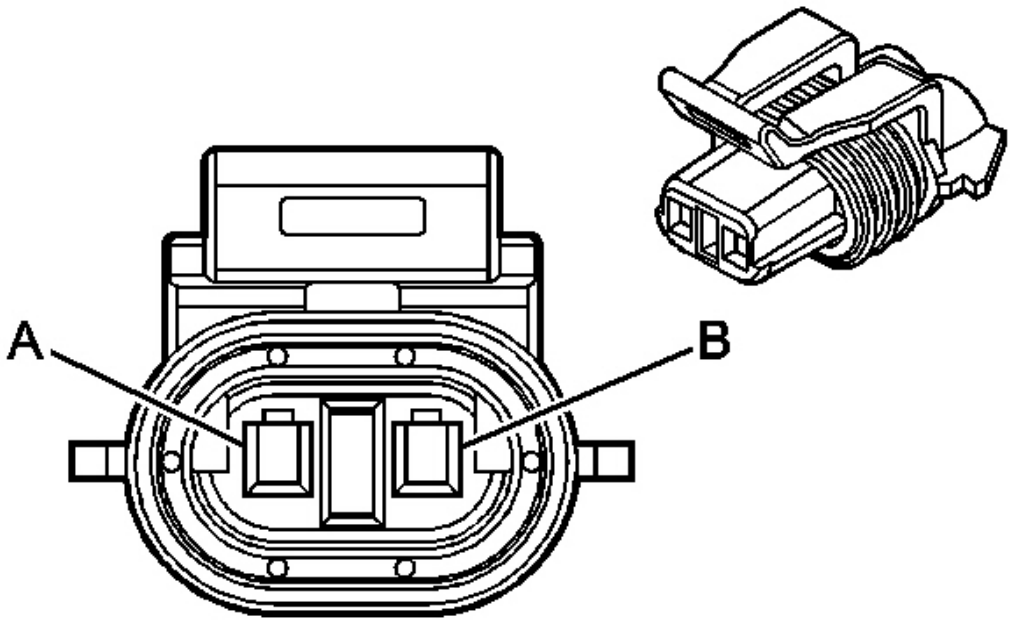


Fig. 13: Skip Shift Solenoid Connector End View
Courtesy of GENERAL MOTORS CORP.

Skip Shift Solenoid Connector Parts Information

Connector Part Information

- OEM: 12052646
- Service: -
- Description: 2-Way F Metri-Pack 150 Series (WH)

Skip Shift Solenoid Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	GY	587	Skip/Shift Solenoid Control
B	PK	239	Ignition 1 Voltage

Transmission Fluid Temperature (TFT) Sensor (KNP)

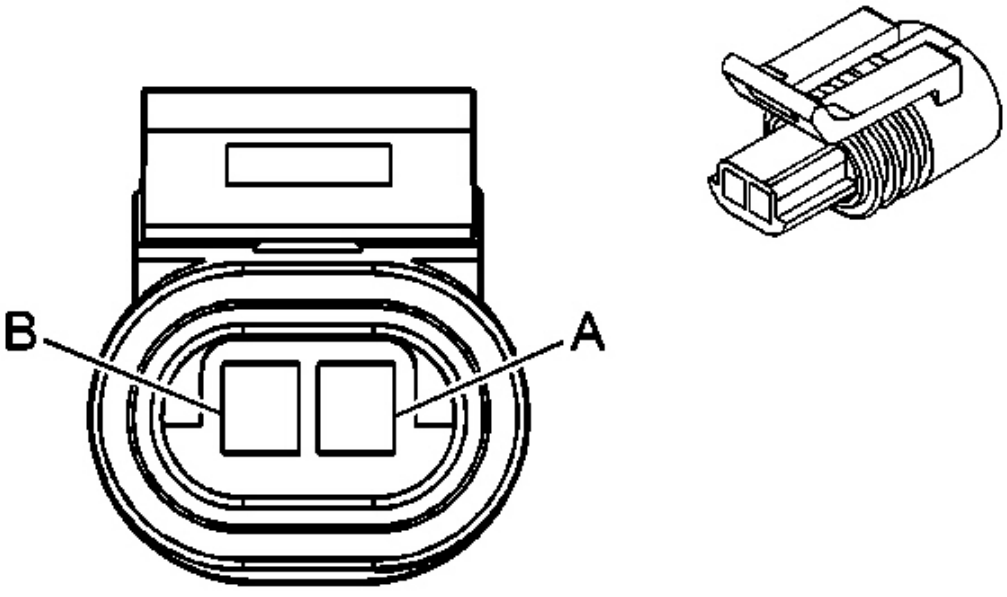


Fig. 14: Transmission Fluid Temperature (TFT) Sensor (KNP) Connector End View
Courtesy of GENERAL MOTORS CORP.

Transmission Fluid Temperature (TFT) Sensor (KNP) Connector Parts Information

Connector Part Information

- OEM: 15449028
- Service: -
- Description: 2-Way F GT 150 Series (BK)

Transmission Fluid Temperature (TFT) Sensor (KNP) Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	OG/BK	586	Low Reference
B	TN/WH	585	TFT Sensor Signal

Vehicle Speed Sensor (VSS)

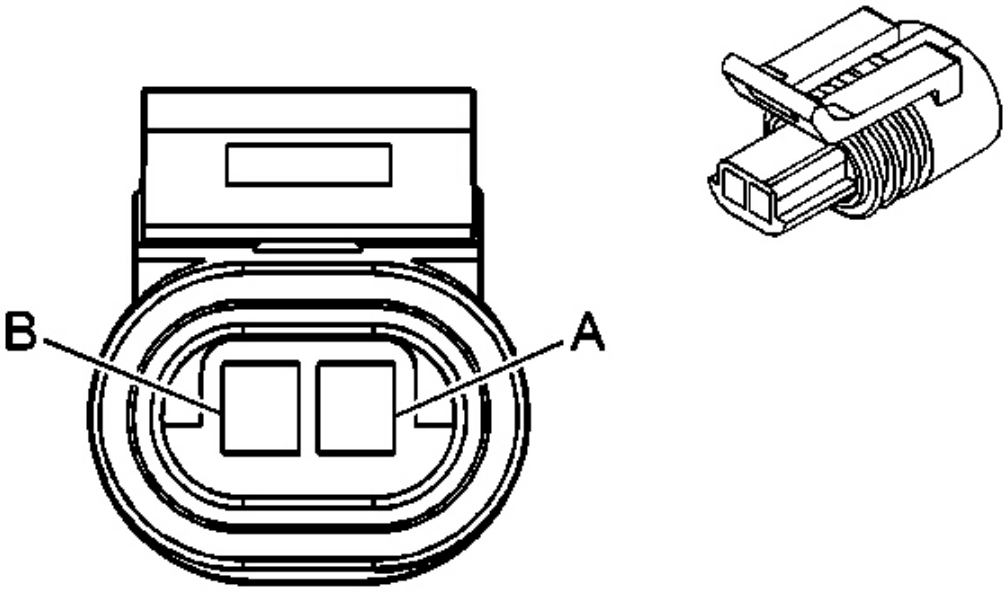


Fig. 15: Vehicle Speed Sensor (VSS) Connector End View
Courtesy of GENERAL MOTORS CORP.

Vehicle Speed Sensor (VSS) Connector Parts Information

Connector Part Information

- OEM: 15449028
- Service: -
- Description: 2-Way F GT 150 Series (BK)

Vehicle Speed Sensor (VSS) Connector Terminal Identification

Pin	Wire Color	Circuit No.	Function
A	PU	401	VSS Low Signal
B	YE	400	VSS High Signal

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC P0502	Vehicle Speed Sensor (VSS) Circuit Low Voltage
DTC P0503	Vehicle Speed Sensor (VSS) Circuit Intermittent
DTC P0712	Transmission Fluid Temperature (TFT) Sensor Circuit Low Voltage
DTC P0713	Transmission Fluid Temperature (TFT) Sensor Circuit High Voltage
DTC P0801	Reverse Inhibit Solenoid Control Circuit
DTC P0803	Skip Shift Solenoid Control Circuit
DTC P0833	Clutch Pedal Switch 2 Circuit

DIAGNOSTIC STARTING POINT - MANUAL TRANSMISSION

Begin the system diagnosis with **Diagnostic System Check - Vehicle** . The Diagnostic System Check will provide the following information:

- The identification of the control module or modules which command the system.
- The ability of the control module or modules to communicate through the serial data circuit.
- The identification of any stored DTCs and the status of the codes.

Use the **Diagnostic System Check - Vehicle** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

SCAN TOOL DATA LIST

Use the scan tool data values under the following conditions:

- The **Diagnostic System Check - Vehicle** is complete.
- The On-Board Diagnostics are functioning properly.
- No DTCs are present.

The values below represent a typical display recorded from a properly functioning system.

IMPORTANT: Do not use a scan tool that displays faulty data. Report the condition to the scan tool manufacturer. The use of a faulty scan tool can result in misdiagnosis and the unnecessary replacement of parts.

Only the parameters listed below are used in this manual for diagnosing. If a scan tool displays other parameters, the values are not recommended by General Motors for use in diagnosis.

Scan tool values below were recorded under the following conditions:

- Engine at idle
- Upper radiator hose hot
- Closed throttle
- Transmission in Neutral
- Closed Loop operation
- Accessories OFF
- Brake pedal not applied

Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
CPP Switch (If Equipped)	1, 9, 11, 15	APPLIED/RELEASED	RELEASED
Reverse Inhibit Solenoid Circuit Status	15	ON/OFF	OFF
Reverse Inhibit Solenoid Command	15		
Skip Shift Lamp Command	13, 15	SKIP/NO SKIP	NO SKIP
Skip Shift Solenoid Circuit Status	15		
Skip Shift Solenoid Command	15		
TFT Sensor (If Equipped)	10, 15	°C/°F	85-115°C (185-239°F)
Vehicle Speed Sensor	ALL	km/h (mph)	0

*Data List Legend

- (1) Engine Data
- (2) EVAP Data
- (3) Fuel Trim Data
- (4) H02S Data
- (5) Ignition Data

- (6) Induction Data
- (7) Misfire Data
- (8) ODM Data
- (9) TAC Data
- (10) Cooling/HVAC Data
- (11) Cruise Control Data
- (12) Electrical/Theft Data
- (13) IPC Data
- (14) Automatic Trans.
- (15) Manual Trans.

SCAN TOOL DATA DEFINITIONS

CPP Switch

This parameter displays the state of the clutch pedal switch circuit input. The scan tool will display APPLIED when the clutch pedal is depressed, and RELEASED when the clutch pedal is released.

Reverse Inhibit Solenoid Command

This parameter displays the commanded state of the reverse inhibit solenoid. When the vehicle speed is greater than 5 km/h (3 mph), the solenoid is commanded ON, inhibiting shifts to Reverse. When the vehicle speed is less than 5 km/h (3 mph), the solenoid is commanded OFF, allowing shifts to Reverse. The scan tool will display ON/OFF.

Skip Shift Lamp Command

This parameter displays the commanded state of the skip shift lamp. The scan tool will display ON/OFF.

Skip Shift Solenoid Command

This parameter displays the commanded state of the skip shift solenoid. The scan tool will display SKIP/NO SKIP.

TFT Sensor

This parameter displays the voltage drop across the transmission fluid temperature (TFT)

sensor circuit. 5 volts is applied to the TFT sensor circuit. The sensor is a thermistor which changes internal resistance based on temperature. When the sensor is cold, the internal resistance is high, resulting in a high signal voltage. As the sensor warms, the internal resistance decreases, and the signal voltage will also decrease. A low signal voltage indicates a warm TFT, and a high signal voltage indicates a cold TFT.

Vehicle Speed Sensor

This parameter displays the speed at which the vehicle is traveling. The scan tool displays vehicle speed as kilometers per hour (km/h), miles per hour (mph). The vehicle speed is calculated based on the input signal from the vehicle speed sensor.

SCAN TOOL OUTPUT CONTROLS

Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection(s)	Description
Reverse Inhibit	Special Functions - Engine Output Controls	Command grounds the reverse lockout solenoid control circuit. Turns the reverse inhibit solenoid ON and OFF.
Skip Shift Solenoid	Special Functions - Engine Output Controls	Command grounds the skip shift solenoid control circuit. Turns the reverse inhibit solenoid ON and OFF.

DIAGNOSTIC TROUBLE CODE (DTC) TYPE DEFINITIONS

Diagnostic trouble codes (DTCs) are categorized into emissions and non-emissions related types. If a DTC is set, the malfunction indicator lamp (MIL) and failure data are utilized by the control module diagnostic executive according to the DTC type. Each DTC is set based upon the individual DTCs running and setting criteria. Read the Action Taken When the DTC Sets and Conditions for Clearing the MIL/DTC in the supporting text for taking appropriate action to each DTC.

Emissions Related DTCs

Type A

The following actions occur at the time of the first failure:

- The MIL is turned ON.
- A DTC is stored in memory.

- The Freeze Frame/Failure Records are stored.
- The Failure Records are updated after the first failure of each ignition cycle.

Some Type A DTCs will not perform the above actions when the DTC first detects a failure. Two consecutive failures are required. This allows systems, such as evaporative emission (EVAP), to accurately identify what failure exists before setting a DTC and requesting MIL illumination.

Type B

The following actions occur at one of the following times:

- First failure:
  - The MIL is not turned ON.
  - A DTC is stored in memory as a Failed Last Test.
  - The Failure Records are stored.
- Second consecutive drive cycle with a failure:
  - The MIL is turned ON.
  - A DTC is stored in memory as a history DTC.
  - The Freeze Frame data is stored.
  - The Failure Records are stored.
- Second non-consecutive drive cycle with a failure:
  - The MIL is not turned ON.
  - A DTC is stored in memory as a Failed Last Test.
  - The Failure Records are stored.

Non-Emissions Related DTCs

Type C

The following actions occur at the time of a failure:

- The MIL does not turn ON.
- A DTC is stored in memory as a history DTC.
- The Failure Records are stored.
- The Failure Records are updated after the first failure of each ignition cycle.
- Some Type C DTCs may also cause an auxiliary service lamp to be illuminated, and/or display a message to the vehicle operator.

Type X

Actions did not occur. These DTCs are coded into the control module software, but will not run for one of the following reasons:

- The associated hardware is not installed with the vehicle emission package.
- The diagnostic is not required for the vehicle emission package.

DIAGNOSTIC TROUBLE CODE (DTC) LIST/TYPE

Diagnostic Trouble Code (DTC) List/Type

DTC	Diagnostic Procedure	DTC Type	Module(s)
P0502	DTC P0502	B	Engine Control Module (ECM)
P0503	DTC P0503	B	Engine Control Module (ECM)
P0712	DTC P0712 (MZ6 and Export)	C	Engine Control Module (ECM)
P0713	DTC P0713 (MZ6 and Export)	C	Engine Control Module (ECM)
P0801	DTC P0801 (Domestic)	C	Engine Control Module (ECM)
P0803	DTC P0803 (Domestic)	B	Engine Control Module (ECM)
P0833	DTC P0833 (Domestic)	B	Engine Control Module (ECM)

DTC P0502

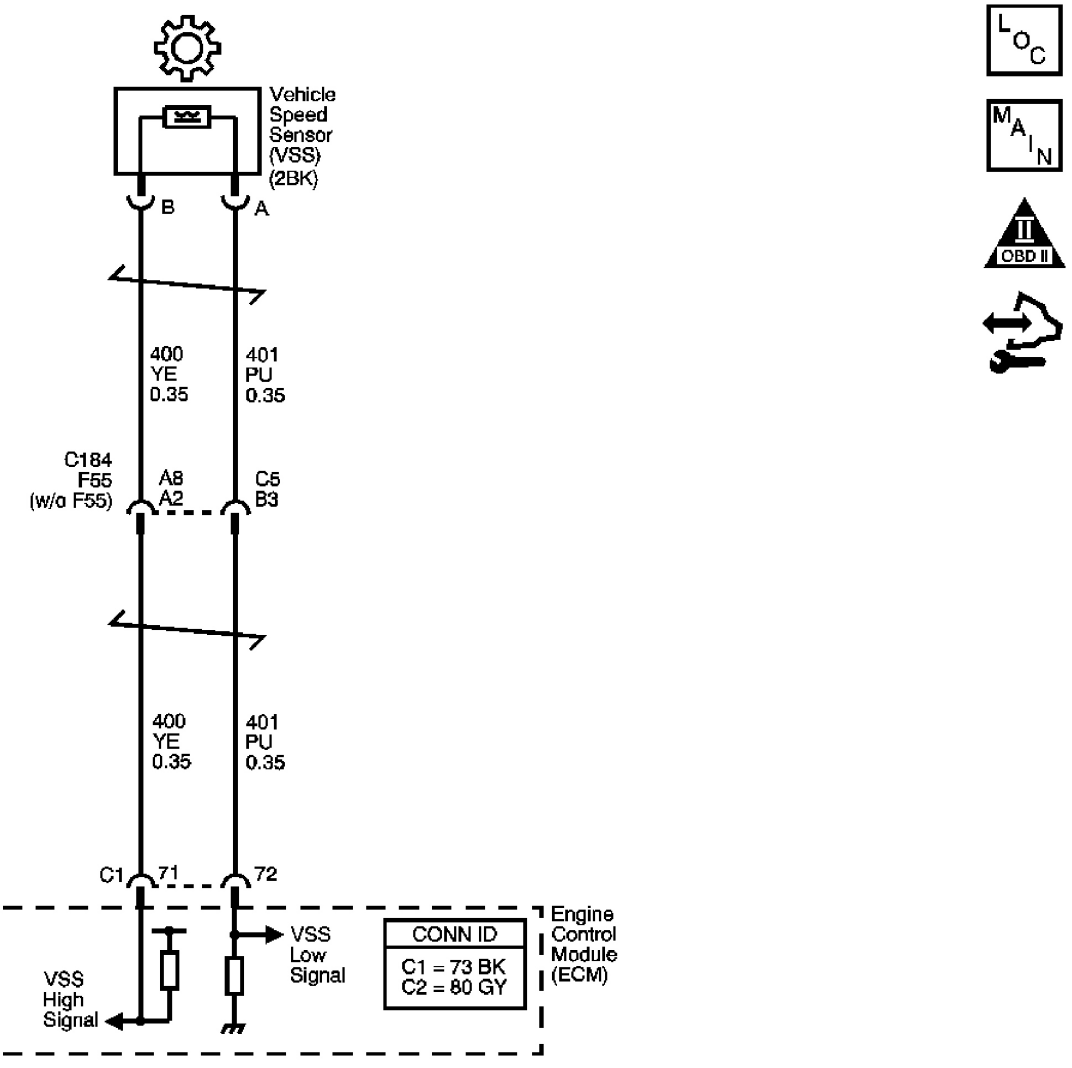


Fig. 16: DTC P0502 Wiring Schematic
Courtesy of GENERAL MOTORS CORP.

Circuit Description

Vehicle speed information is provided to the engine control module (ECM) by the vehicle speed sensor (VSS). The VSS is a permanent magnet generator that is mounted on the transmission and produces a pulsing voltage. The AC voltage amplitude and frequency increases with vehicle speed. The ECM converts the pulsing voltage into km/h (mph). The ECM supplies the necessary signal to the instrument panel for speedometer, odometer operation and to the cruise control module. The ECM also supplies the signal to the body control module (BCM), and the electronic suspension control module, if equipped.

If the ECM detects no vehicle speed signal for 10 seconds, DTC P0502 sets. DTC P0502 is a

type B DTC.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0502 Vehicle Speed Sensor (VSS) Circuit Low Voltage

Conditions for Running the DTC

- No MAP sensor DTC P0106.
- No idle control system DTCs P0506 or P0507.
- No TP sensor DTCs P0120 or P0220.
- The engine speed is between 1,000 and 5,000 RPM.
- The engine torque is between 68 N.m (50 lb ft) and 8,200 N.m (6,048 lb ft).
- The throttle position (TP) angle is 5-100 percent.

Conditions for Setting the DTC

The ECM detects no vehicle speed signal, 0 km/h (0 mph), for 10 seconds.

Action Taken When the DTC Sets

- The ECM illuminates the malfunction indicator lamp (MIL) during the second consecutive trip in which the Conditions for Setting the DTC are met.
- The ECM disables Cruise Control.
- The ECM commands the coolant fan ON.
- The ECM records the operating conditions when the Conditions for Setting the DTC are met. The ECM stores this information as Freeze Frame and Failure Records.
- The ECM stores DTC P0502 in ECM history during the second consecutive trip in which the Conditions for Setting the DTC are met.

Conditions for Clearing the MIL/DTC

- The ECM turns OFF the MIL during the third consecutive trip in which the diagnostic test runs and passes.
- A scan tool can clear the MIL/DTC.
- The ECM clears the DTC from ECM history if the vehicle completes 40 warm-up cycles without an emission-related diagnostic fault occurring.
- The ECM cancels the DTC default actions when the fault no longer exists and the DTC

passes.

Diagnostic Aids

Ensure the VSS is correctly torqued to the transmission housing.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4: The vehicle speed detector in the ECM and the VSS are matched in such a way that an open or a short to ground in the VSS low signal circuit will not usually cause a loss of speed signal or a DTC P0502 to set.

7: This step isolates the short between the VSS and the wiring.

9: The DMM will detect AC voltage if the VSS high signal circuit is shorted to ground.

DTC P0502

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	**NOTE:** **In order to avoid damage to the drive axles, support the lower control arms in the normal horizontal position. Do not run the vehicle in gear with the wheels hanging down at full travel.** 1. Install a scan tool. 2. Turn ON the ignition with the engine OFF. **IMPORTANT:** **Record the Freeze Frame and Failure Records before clearing the DTCs. Using the Clear Info function erases the Freeze Frame and Failure Records from the ECM.**	0 km/h (0 mph)		

	3. Record the DTC Freeze Frame and Failure Records. 4. Clear the DTC. 5. Raise the drive wheels. 6. Start the engine. 7. Allow the engine to idle in gear. Does the scan tool display vehicle speed above the specified value?		Go to **Step 3**	Go to **Step 4**
3	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Review the Freeze Frame data and note the parameters. 4. Start the engine. 5. Operate the vehicle within the Freeze Frame Conditions and the Conditions for Running the DTC. Does the scan tool display vehicle speed above the specified value?	0 km/h (0 mph)	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 4**
4	1. Turn OFF the ignition. 2. Disconnect the ECM. 3. Measure the resistance between the VSS low signal and the VSS high signal circuits. Is the resistance within the specified range?	966-2,200 ohms	Go to **Step 6**	Go to **Step 5**
	Test the VSS high signal circuit and the VSS low signal circuit for the following conditions: • An open circuit or high resistance condition			

5	• VSS high signal circuit and VSS low signal circuit shorted together Refer to **Circuit Testing** . Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 10**
6	Measure the resistance between the VSS high signal circuit and ground. Is the resistance greater than the specified value?	50 K ohms	Go to **Step 9**	Go to **Step 7**
7	1. Leave the DMM connected between the VSS high signal circuit and ground. 2. Disconnect the VSS. 3. Measure the resistance between the VSS high signal circuit and ground. Is the resistance greater than the specified value?	50 K ohms	Go to **Step 10**	Go to **Step 8**
8	Repair the short to ground in the VSS high signal circuit. Refer to **Testing for Short to Ground** and **Wiring Repairs** . Did you complete the repair?	-	Go to **Step 14**	-
9	1. Connect the DMM between the VSS low signal and the VSS high signal circuits. 2. Measure the AC voltage with the DMM while rotating the drive wheels by hand. Is the AC voltage equal to or greater than the specified value?	0.5 V	Go to **Step 11**	Go to **Step 10**
	1. Remove the VSS.			

10	Refer to **Vehicle Speed Sensor Replacement** . 2. Inspect the VSS and the VSS rotor for the following conditions: • VSS damage • VSS rotor damage • Excessive air gap between the VSS rotor and the VSS • Incorrect alignment between the VSS and the VSS rotor 3. Repair or replace any of the above items as necessary. Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 12**
11	Test the high signal circuit of the VSS for a short to voltage. refer to **Testing for a Short to Voltage** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 12**
12	Replace the VSS. Refer to **Vehicle Speed Sensor Replacement** . Did you complete the repair?	-	Go to **Step 14**	-
13	Replace the ECM. Refer to **Control Module References** for replacement, setup, and programming. Is the action complete?	-	Go to **Step 14**	-
	Perform the following procedure in order to verify the repair: 1. Select DTC. 2. Select Clear Info.			

14	3. Operate the vehicle in order to achieve a vehicle speed of greater than 3 km/h (2 mph) for 2 seconds. 4. Select Specific DTC. 5. Enter DTC P0502. Has the test run and passed?	-	Go to **Step 15**	Go to **Step 2**
15	With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	System OK

DTC P0503

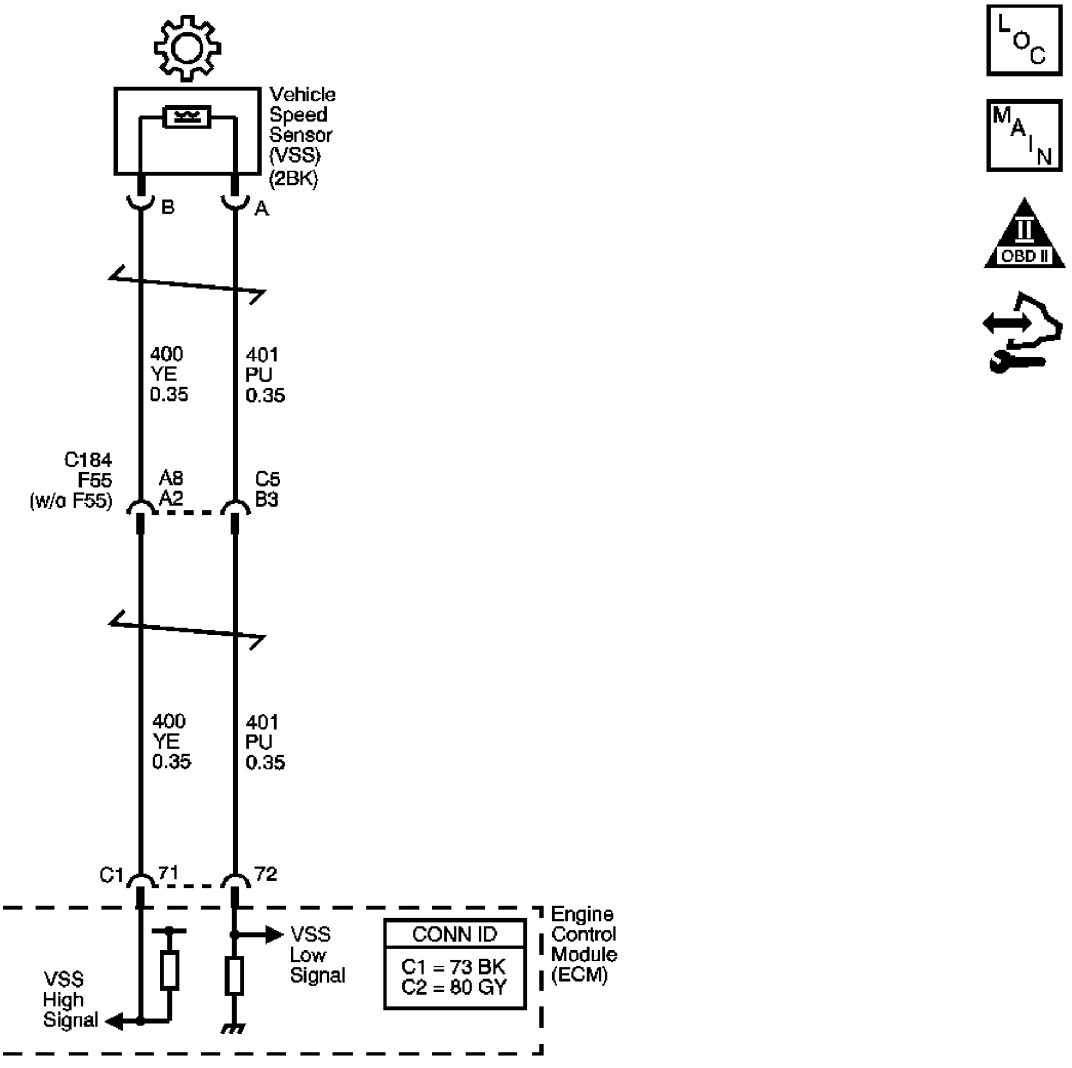


Fig. 17: DTC P0503 Wiring Schematic
Courtesy of GENERAL MOTORS CORP.

Circuit Description

Vehicle speed information is provided to the engine control module (ECM) by the vehicle speed sensor (VSS). The VSS is a permanent magnet generator that is mounted on the transmission and produces a pulsing voltage. The AC voltage amplitude and frequency increases with vehicle speed. The ECM converts the pulsing voltage into km/h (mph). The ECM supplies the necessary signal to the instrument panel for speedometer, odometer operation and to the cruise control module. The ECM also supplies the signal to the body control module (BCM), and the electronic suspension control module, if equipped.

If the ECM detects a vehicle speed drop for 6 seconds, DTC P0503 sets. DTC P0503 is a type B

DTC.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0503 Vehicle Speed Sensor (VSS) Circuit Intermittent

Conditions for Running the DTC

- No MAP sensor DTC P0106.
- No idle control system DTCs P0506 or P0507.
- No TP sensor DTCs P0120 or P0220.
- The vehicle speed is greater than 13 km/h (8 mph) for 6 seconds and has not increased by 6 km/h (4 mph) or greater for at least 0.5 seconds.
- All conditions are met for more than 6 seconds.

Conditions for Setting the DTC

The ECM detects a vehicle speed drop for 6 seconds.

Action Taken When the DTC Sets

- The ECM illuminates the malfunction indicator lamp (MIL) during the second consecutive trip in which the Conditions for Setting the DTC are met.
- The ECM disables Cruise Control.
- The ECM commands the coolant fan ON.
- The ECM records the operating conditions when the Conditions for Setting the DTC are met. The ECM stores this information as Freeze Frame and Failure Records.
- The ECM stores DTC P0503 in ECM history during the second consecutive trip in which the Conditions for Setting the DTC are met.

Conditions for Clearing the MIL/DTC

- The ECM turns OFF the MIL during the third consecutive trip in which the diagnostic test runs and passes.
- A scan tool can clear the MIL/DTC.
- The ECM clears the DTC from ECM history if the vehicle completes 40 warm-up cycles without an emission-related diagnostic fault occurring.
- The ECM cancels the DTC default actions when the fault no longer exists and the DTC

passes.

Diagnostic Aids

Ensure the VSS is correctly torqued to the transmission housing.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

4: The vehicle speed detector in the ECM and the VSS are matched in such a way that an open or a short to ground in the VSS low signal circuit will not usually cause a loss of speed signal or a DTC P0503 to set.

7: This step isolates the short between the VSS and the wiring.

9: The DMM will detect AC voltage if the VSS high signal circuit is shorted to ground.

DTC P0503

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
2	**NOTE:** **In order to avoid damage to the drive axles, support the lower control arms in the normal horizontal position. Do not run the vehicle in gear with the wheels hanging down at full travel.** 1. Install a scan tool. 2. Turn ON the ignition with the engine OFF. **IMPORTANT:** **Record the Freeze Frame and Failure Records before clearing the DTCs. Using the Clear Info function erases the Freeze Frame and Failure Records from the ECM.**	0 km/h (0 mph)		

	3. Record the DTC Freeze Frame and Failure Records. 4. Clear the DTC. 5. Raise the drive wheels. 6. Start the engine. 7. Allow the engine to idle in gear. Does the scan tool display vehicle speed above the specified value?		Go to **Step 3**	Go to **Step 4**
3	1. Turn OFF the ignition. 2. Turn ON the ignition, with the engine OFF. 3. Review the Freeze Frame data and note the parameters. 4. Start the engine. 5. Operate the vehicle within the Freeze Frame Conditions and the Conditions for Running the DTC. Does the scan tool display vehicle speed above the specified value?	0 km/h (0 mph)	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 4**
4	1. Turn OFF the ignition. 2. Disconnect the ECM. 3. Measure the resistance between the VSS low signal and the VSS high signal circuits. Is the resistance within the specified range?	966-2,200 ohms	Go to **Step 6**	Go to **Step 5**
	Test the VSS high signal circuit and the VSS low signal circuit for the following conditions: • An open circuit or high resistance condition			

5	• VSS high signal circuit and VSS low signal circuit shorted together Refer to **Circuit Testing** . Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 10**
6	Measure the resistance between the VSS high signal circuit and ground. Is the resistance greater than the specified value?	50 K ohms	Go to **Step 9**	Go to **Step 7**
7	1. Leave the DMM connected between the VSS high signal circuit and ground. 2. Disconnect the VSS. 3. Measure the resistance between the VSS high signal circuit and ground. Is the resistance greater than the specified value?	50 K ohms	Go to **Step 10**	Go to **Step 8**
8	Repair the short to ground in the VSS high signal circuit. Refer to **Testing for Short to Ground** and **Wiring Repairs** . Did you complete the repair?	-	Go to **Step 14**	-
9	1. Connect the DMM between the VSS low signal and the VSS high signal circuits. 2. Measure the AC voltage with the DMM while rotating the drive wheels by hand. Is the AC voltage equal to or greater than the specified value?	0.5 V	Go to **Step 11**	Go to **Step 10**
	1. Remove the VSS.			

10	Refer to **Vehicle Speed Sensor Replacement** . 2. Inspect the VSS and the VSS rotor for the following conditions: • VSS damage • VSS rotor damage • Excessive air gap between the VSS rotor and the VSS • Incorrect alignment between the VSS and the VSS rotor 3. Repair or replace any of the above items as necessary. Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 12**
11	Test the high signal circuit of the VSS for a short to voltage. refer to **Testing for a Short to Voltage** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 12**
12	Replace the VSS. Refer to **Vehicle Speed Sensor Replacement** . Did you complete the repair?	-	Go to **Step 14**	-
13	Replace the ECM. Refer to **Control Module References** for replacement, setup, and programming. Is the action complete?	-	Go to **Step 14**	-
	Perform the following procedure in order to verify the repair: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle in order to achieve a vehicle speed of			

14	greater than 3 km/h (2 mph) for 2 seconds. 4. Select Specific DTC. 5. Enter DTC P0503. Has the test run and passed?	-	Go to **Step 15**	Go to **Step 2**
15	With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	System OK

DTC P0712

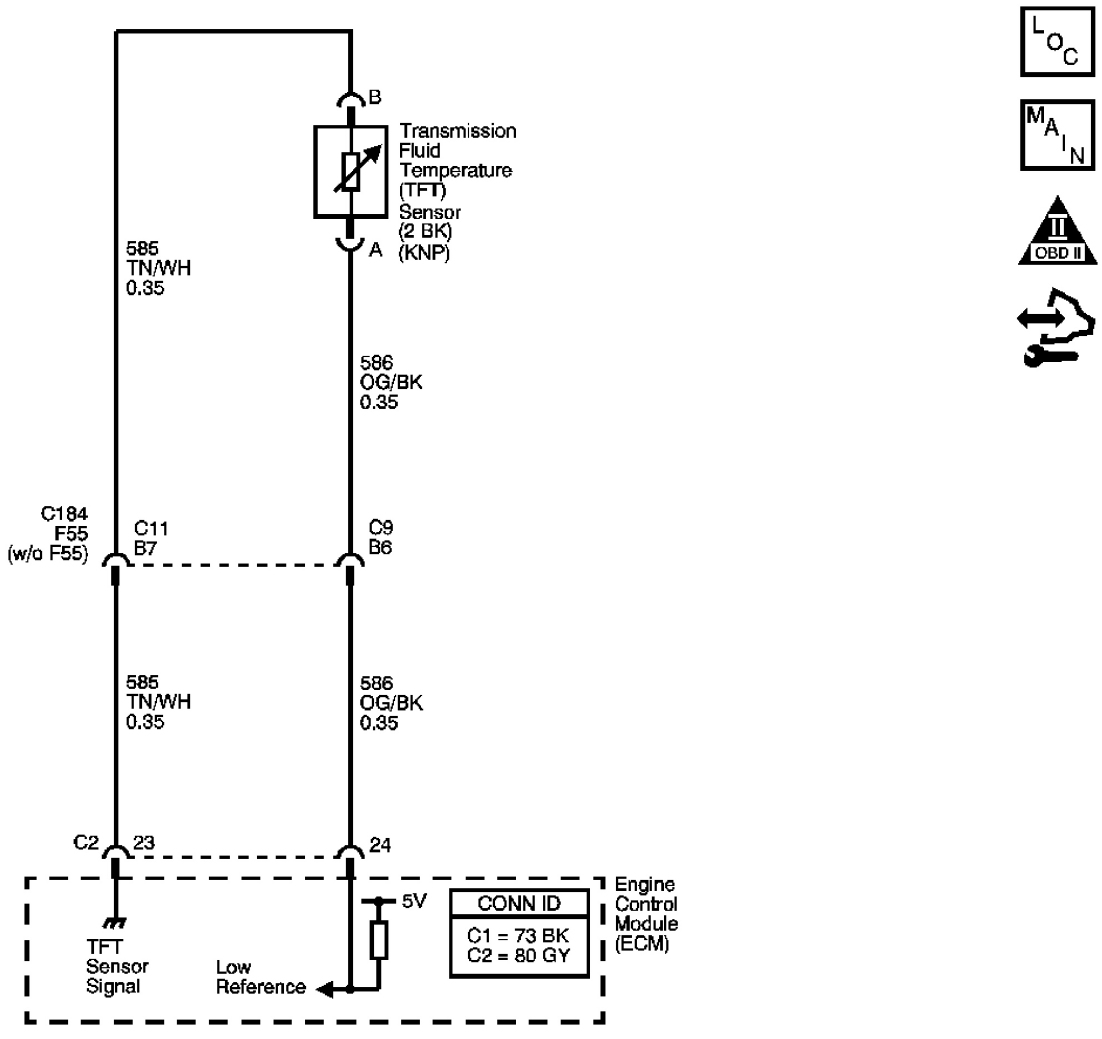


Fig. 18: DTC P0712 Wiring Diagram
Courtesy of GENERAL MOTORS CORP.

Circuit Description

IMPORTANT: This diagnostic procedure is for manual transmission vehicles with RPO VD1 and/or RPO Z06.

The transmission fluid temperature (TFT) sensor contains a semiconductor device which changes the resistance based on the temperature, a thermistor. The TFT sensor has a signal circuit and a ground circuit. The engine control module (ECM) applies a voltage, approximately 5 volts, on the signal circuit to the sensor. The ECM monitors the changes in this voltage caused by changes in the resistance of the sensor in order to determine he fluid temperature.

When the ECM senses a signal voltage lower than the normal operating range of the sensor, DTC P0712 sets. DTC P0712 is a type C DTC.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0712 Transmission Fluid Temperature (TFT) Sensor Circuit Low Voltage

Conditions for Running the DTC

The engine speed is above 1,000 RPM for 7 seconds.

Conditions for Setting the DTC

- The TFT is greater than 145°C (299°F).
- All conditions are met for 5 seconds.

Action Taken When the DTC Sets

- The ECM stores the DTC information into memory when the diagnostic runs and fails.
- The malfunction indicator lamp (MIL) will not illuminate.
- The ECM records the operating conditions at the time the diagnostic fails. The ECM stores this information in the Failure Records.
- A message is displayed on the drivers information center (DIC).

Conditions for Clearing the DTC

- A scan tool can clear the DTC.
- The ECM clears the DTC from ECM history if the vehicle completes 40 warm-up cycles without a non-emission-related diagnostic fault occurring.
- The ECM cancels the DTC default actions when the fault no longer exists and the DTC passes.

Diagnostic Aids

IMPORTANT:

- **Remove any debris from the ECM connector surfaces before servicing the ECM. Inspect the ECM connector gaskets when diagnosing/replacing the module. Ensure that the gaskets are installed correctly. The gaskets prevent contaminate intrusion into the ECM.**

- **For any test that requires probing the ECM or a component harness connector, use the J 35616 GM terminal test kit. Using this kit prevents damage to the harness/component terminals. Refer to Using Connector Test Adapters .**

- If the engine has sat overnight, the TFT and the intake air temperature values should display within a few degrees of each other. If the temperatures are not within 3°C (5°F), refer to **Temperature Versus Resistance** .
- For an intermittent, refer to **Symptoms - Engine Controls** .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This step determines if the malfunction is present.

3: Using the Freeze Frame/Failure Records data may aid in locating an intermittent condition. If you cannot duplicate the DTC, the information included in the Freeze Frame/Failure Records data can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can also help determine how many ignition cycles the diagnostic reported a pass and/or a fail. Operate the vehicle within the same freeze frame conditions, such as RPM, load, vehicle speed, temperature, that you observed. This will isolate when the DTC failed.

4: A TFT below -30°C (-22°F) indicates the ECM and the TFT sensor wiring are OK.

5: Disconnecting the ECM enables the DMM to test continuity of the circuits. This aids in locating an open or a shorted circuit.

7: This step inspects for proper terminal tension/connections at the ECM harness before replacing the ECM.

DTC P0712

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF.			

2	**IMPORTANT:** **Record the Freeze Frame and Failure Records before clearing the DTCs. Using the Clear Info function erases the Freeze Frame and Failure Records from the ECM.** 3. Monitor the TFT sensor display on the Engine 3 Data List of the scan tool. Is the TFT sensor above the specified value?	150°C (302° F)	Go to **Step 4**	Go to **Step 3**
3	1. Turn ON the ignition, with the engine OFF. 2. Review the Freeze Frame/Failure Records data for this DTC and observe the parameters. 3. Turn OFF the ignition for 15 seconds. 4. Start the engine. 5. Operate the vehicle within the conditions required for this diagnostic to run, and as close to the conditions recorded in the Freeze Frame/Failure Records as possible. Special operating conditions that you need to meet before the ECM will run this diagnostic, where applicable, are listed in Conditions for Running the DTC. 6. Select the Diagnostic Trouble Code (DTC) option, the Specific DTC option, then enter the DTC number using the scan tool. Does the scan tool indicate that the diagnostic failed this ignition?	-	Go to **Step 4**	Go to Diagnostic Aids

4	1. Disconnect the TFT sensor electrical connector. 2. Observe the TFT sensor display on the scan tool. Is the TFT sensor below the specified value?	-30°C (-22° F)	Go to **Step 6**	Go to **Step 5**
5	1. Turn OFF the ignition. 2. Disconnect the ECM connector C3. 3. Test the TFT sensor signal circuit for a short to a ground. Refer to **Testing for Short to Ground** . 4. If you find the TFT sensor signal circuit is grounded, repair the circuit as necessary. Refer to **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 8**	Go to **Step 7**
6	Replace the TFT sensor. Refer to **Transmission Fluid Temperature Sensor Replacement**. Is the action complete?	-	Go to **Step 8**	-
7	Replace the ECM. Refer to **Control Module References** for replacement, setup, and programming. Is the action complete?	-	Go to **Step 8**	-
8	Perform the following procedure in order to verify the repair: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Turn ON the ignition, with the engine OFF. • The Trans. Fluid Temp.	-		

	must be 144°C (291°F) or less for 10 seconds. 4. Select Specific DTC. 5. Enter DTC P0712 Has the test run and passed?		Go to **Step 9**	Go to **Step 2**
9	With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	System OK

DTC P0713

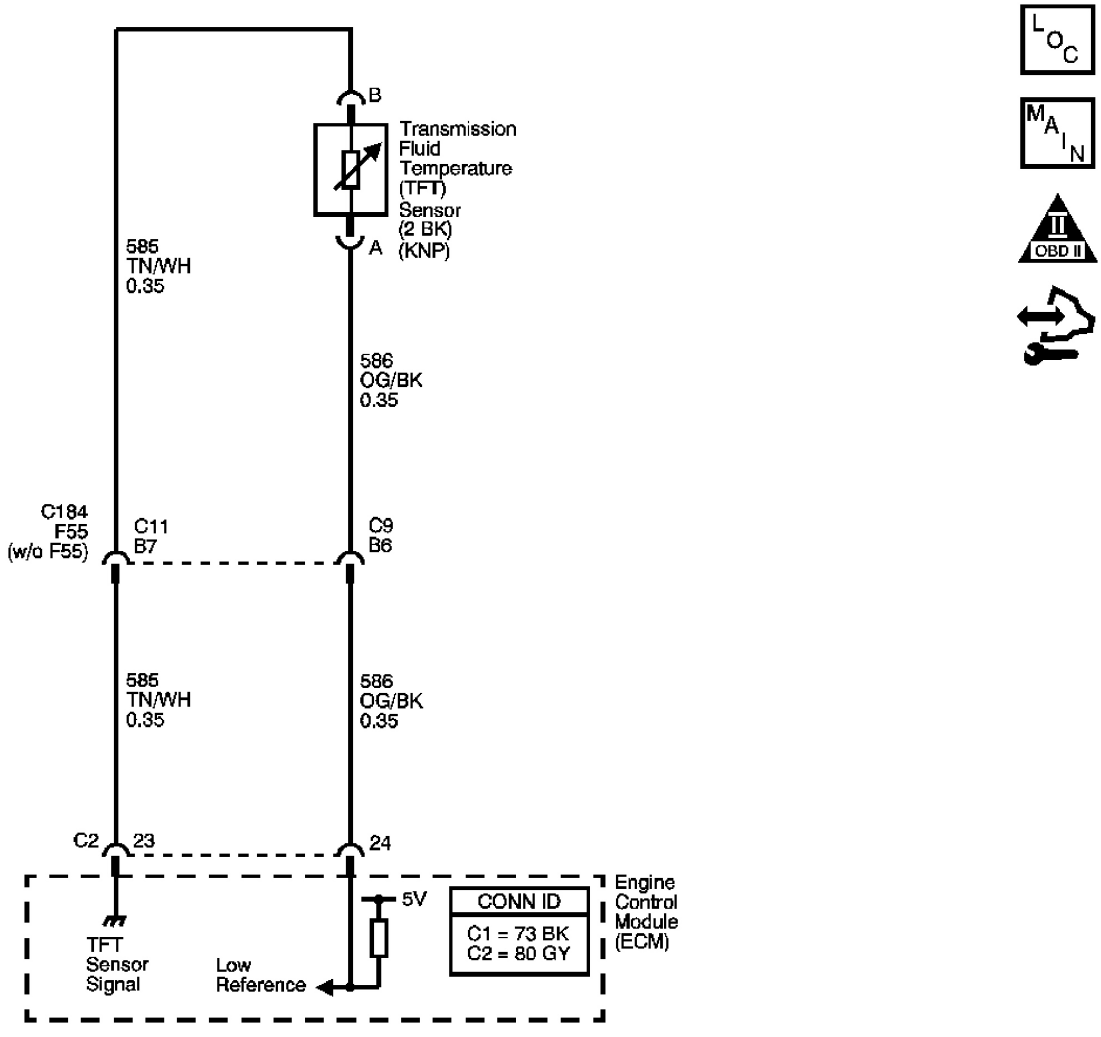


Fig. 19: DTC P0713 Wiring Diagram
Courtesy of GENERAL MOTORS CORP.

Circuit Description

IMPORTANT: This diagnostic procedure is for manual transmission vehicles with RPO VD1 and/or RPO Z06.

The transmission fluid temperature (TFT) sensor contains a semiconductor device which changes the resistance based on the temperature, a thermistor. The TFT sensor has a signal circuit and a ground circuit. The engine control module (ECM) applies a voltage, approximately 5.0 volts, on the signal circuit to the sensor. The ECM monitors the changes in this voltage caused by changes in the resistance of the sensor in order to determine the fluid temperature.

When the ECM senses a signal voltage lower than the normal operating range of the sensor, DTC P0713 sets. DTC P0713 is a type C DTC.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0713 Transmission Fluid Temperature (TFT) Sensor Circuit High Voltage

Conditions for Running the DTC

The engine speed is above 1,000 RPM for 7 seconds.

Conditions for Setting the DTC

- The TFT is less than -35°C (-31°F).
- The conditions are met for 5 seconds.

Action Taken When the DTC Sets

- The ECM stores the DTC information into memory when the diagnostic runs and fails.
- The malfunction indicator lamp (MIL) will not illuminate.
- The ECM records the operating conditions at the time the diagnostic fails. The ECM stores this information in the Failure Records.
- A message is displayed on the drivers information center (DIC).

Conditions for Clearing the DTC

- A scan tool can clear the DTC.
- The ECM clears the DTC from ECM history if the vehicle completes 40 warm-up cycles without a non-emission-related diagnostic fault occurring.
- The ECM cancels the DTC default actions when the fault no longer exists and the DTC passes.

Diagnostic Aids

IMPORTANT:

- **Remove any debris from the ECM connector surfaces before servicing the ECM. Inspect the ECM connector gaskets when diagnosing/replacing the module. Ensure that the gaskets are installed correctly. The gaskets prevent contaminate intrusion into the ECM.**

- **For any test that requires probing the ECM or a component harness connector, use the J 35616 GM terminal test kit. Using this kit prevents damage to the harness/component terminals. Refer to Using Connector Test Adapters .**

- If the engine has sat overnight, the TFT and the intake air temperature values should display within a few degrees of each other. If the temperatures are not within 3°C (5°F), refer to **Temperature Versus Resistance** .
- For an intermittent, refer to **Symptoms - Engine Controls** .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This step determines if the malfunction is present.

3: Using the Freeze Frame/Failure Records data may aid in locating an intermittent condition. If you cannot duplicate the DTC, the information included in the Freeze Frame/Failure Records data can help determine how many miles since the DTC set. The Fail Counter and Pass Counter can also help determine how many ignition cycles the diagnostic reported a pass and/or a fail. Operate the vehicle within the same freeze frame conditions, such as RPM, load, vehicle speed, temperature, that you observed. This will isolate when the DTC failed.

4: A TFT above 139°C (282°F) indicates the ECM and TFT sensor wiring is OK.

5: A TFT above 139°C (282°F) indicates the ECM and TFT sensor signal circuit is OK.

6: Disconnecting the ECM allows using the DMM in order to test continuity of the circuits. This aids in locating an open or a shorted circuit.

8: Disconnecting the ECM allows using the DMM in order to test continuity of the circuits. This aids in locating an open or a shorted circuit.

11: This step inspects for proper terminal tension/connections at the ECM harness before replacing the ECM.

DTC P0713

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**

2	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. **IMPORTANT:** **Record the Freeze Frame and Failure Records before clearing the DTCs. Using the Clear Info function erases the Freeze Frame and Failure Records from the ECM.** 3. Monitor the TFT sensor display on the Engine 3 Data List of the scan tool. Is the TFT sensor below the specified value?	-39°C (-38° F)	Go to **Step 4**	Go to **Step 3**
3	1. Turn ON the ignition, with the engine OFF. 2. Review the Freeze Frame/Failure Records data for this DTC and observe the parameters. 3. Turn OFF the ignition for 15 seconds. 4. Start the engine. 5. Operate the vehicle within the conditions required for this diagnostic to run, and as close to the conditions recorded in the Freeze Frame/Failure Records as possible. Special operating conditions that you need to meet before the ECM will run this diagnostic, where applicable, are listed in Conditions for Running the DTC. 6. Select the Diagnostic Trouble Code (DTC) option, the Specific DTC option, then enter the DTC	-		

	number using the scan tool. Does the scan tool indicate that the diagnostic failed this ignition?		Go to **Step 4**	Go to Diagnostic Aids
4	1. Disconnect the TFT sensor electrical connector. 2. Connect a 3 amp fused jumper wire between the signal circuit of the TFT sensor and the low reference circuit of the TFT sensor. 3. Observe the TFT Sensor parameter on the scan tool. Is the TFT sensor above the specified value?	149°C (284° F)	Go to **Step 9**	Go to **Step 5**
5	Connect a fused jumper wire from the TFT sensor signal circuit to a ground. Is the TFT sensor at the specified value?	149°C (284° F)	Go to **Step 8**	Go to **Step 6**
6	1. Turn OFF the ignition. 2. Disconnect the ECM connector C3. 3. Test the TFT sensor signal circuit for an open. Refer to **Testing for Continuity** . Is the TFT sensor signal circuit open?	-	Go to **Step 7**	Go to **Step 11**
7	Repair the TFT sensor signal circuit. Refer to **Wiring Repairs** . Is the action complete?	-	Go to **Step 14**	-
8	1. Turn OFF the ignition. 2. Disconnect the ECM connector C3. 3. Test the TFT sensor ground circuit for an open. Refer to **Circuit Testing** .	-		

	Is the TFT sensor ground circuit open?		Go to **Step 10**	Go to **Step 11**
9	Replace the TFT sensor. Refer to **Transmission Fluid Temperature Sensor Replacement**. Is the action complete?	-	Go to **Step 14**	-
10	Repair the TFT sensor ground circuit. Refer to **Wiring Repairs** . Did you complete the action?	-	Go to **Step 14**	-
11	Test for a short to voltage on the signal circuit. Refer to **Testing for a Short to Voltage** and **Wiring Repairs** . Did you find and correct the condition?	-	Go to **Step 14**	Go to **Step 12**
12	Inspect for poor connections at the ECM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Repairing Connector Terminals** . Did find and correct the condition?	-	Go to **Step 14**	Go to **Step 13**
13	Replace the ECM. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	-	Go to **Step 14**	-
14	Perform the following procedure in order to verify the repair: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle under the following conditions: • Turn ON the ignition, with the engine OFF. • The Trans. Fluid Temp. must be greater than -40°C (-40° F) for 10 seconds. 4. Select Specific DTC. 5. Enter DTC P0713.	-		

	Has the test run and passed?		Go to **Step 15**	Go to **Step 2**
15	With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	System OK

DTC P0801

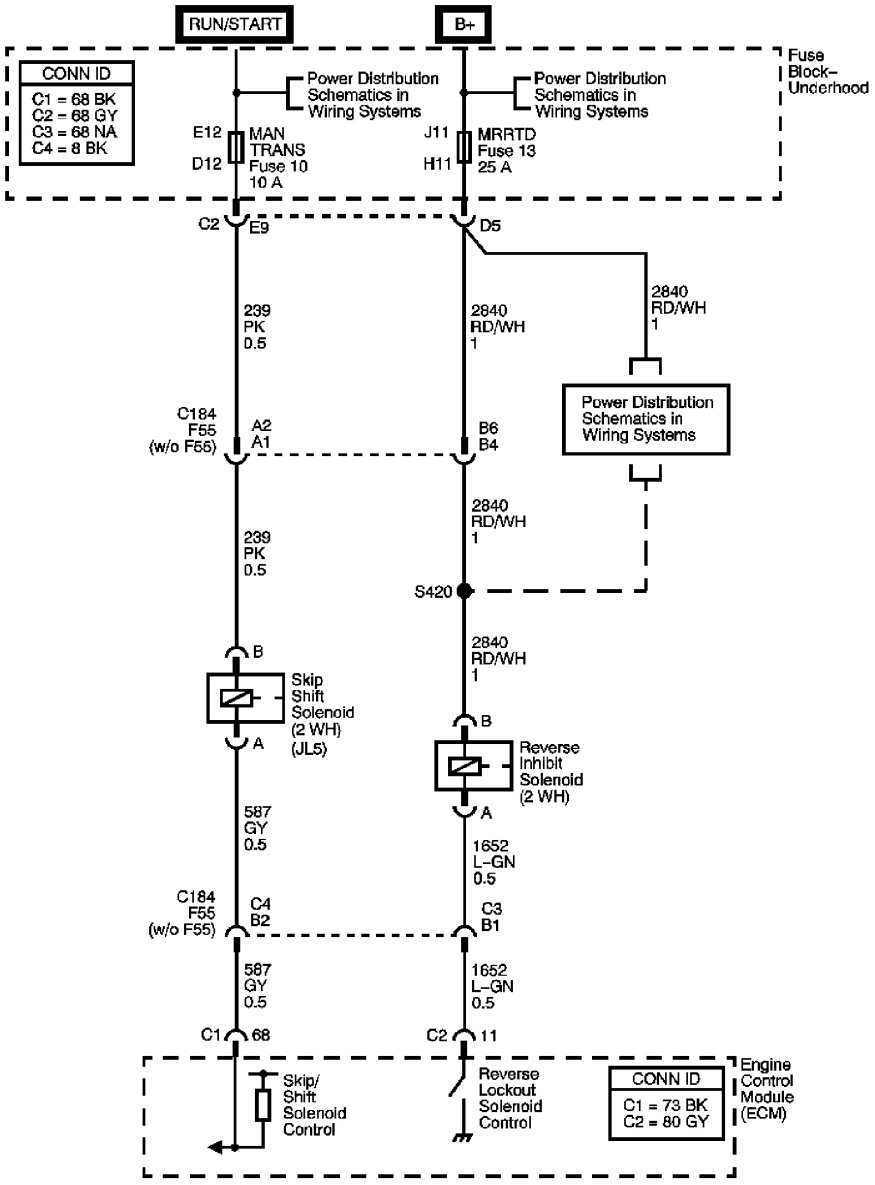


Fig. 20: DTC P0801 Wiring Diagram
Courtesy of GENERAL MOTORS CORP.

Circuit Description

With the ignition ON battery voltage is supplied directly to the reverse inhibit solenoid. The engine control module (ECM) controls the solenoid by grounding the control circuit via an internal switch called a driver. The driver supplies the ground for the component being controlled. Each driver has a fault line which the ECM monitors. When the ECM commands a component ON, the voltage of the control circuit should be low, near 0 volts. When the ECM commands the control circuit to a component OFF, the voltage potential of the circuit should be high, near battery voltage. If the internal fault detection circuit senses a voltage other than what is expected, the fault line status changes, causing DTC P0801 to set. DTC P0801 is a type C DTC.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0801 Reverse Inhibit Solenoid Control Circuit

Conditions for Running the DTC

- The engine is running.
- The vehicle speed is less than 3 km/h (2 mph).

Conditions for Setting the DTC

- The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.
- Condition must exist for a minimum of 2 seconds.

Action Taken When the DTC Sets

- The ECM stores the DTC information into memory when the diagnostic runs and fails.
- The malfunction indicator lamp (MIL) will not illuminate.
- The ECM records the operating conditions at the time the diagnostic fails and stores this information in the Failure Records.

Conditions for Clearing the DTC

- A scan tool can clear the DTC.
- The ECM clears the DTC from ECM history if the vehicle completes 40 warm-up cycles

without a non-emission-related diagnostic fault occurring.

- The ECM cancels the DTC default actions when the fault no longer exists and the DTC passes.

Diagnostic Aids

- Remove any debris from the ECM connector surfaces before servicing the ECM. Inspect the ECM connector gaskets when diagnosing/replacing the ECM. Ensure that the gaskets are installed correctly. The gaskets prevent contaminate intrusion into the ECM.
- For any test that requires probing the ECM or a component harness connector, use the **J 35616** connector test adapter kit. Using this kit prevents damage to the harness/component terminals. Refer to **Using Connector Test Adapters** .
- Low system voltage can cause this DTC to set. When reviewing captured data, verify if a low system voltage condition was present at the time the DTC was stored in memory.
- For an intermittent condition, refer to **Testing for Intermittent Conditions and Poor Connections** .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Listen for an audible click when the reverse inhibit solenoid operates. Command both the ON and OFF states. Repeat the commands as necessary.

3: Tests for voltage at the coil side of the reverse inhibit solenoid. The ENG IGN 1 fuse supplies power to the coil side of the reverse inhibit solenoid.

5: Verifies that the ECM is providing ground to the reverse inhibit solenoid.

6: Tests if ground is constantly being applied to the reverse inhibit solenoid.

DTC P0801

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF. **IMPORTANT:** **Record the Freeze Frame and**		

	Failure Records before clearing the DTCs. Using the Clear Info function erases the Freeze Frame and Failure Records from the ECM.		
2	3. With a scan tool, command the reverse inhibit solenoid ON and OFF. Does the reverse inhibit solenoid turn ON and OFF?	Go to **Step 3**	Go to **Step 4**
3	1. Observe the Freeze Frame and/or Failure records data for this DTC. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	Go to **Step 4**	Go to **Testing for Intermittent Conditions and Poor Connections**
4	1. Turn OFF the ignition. 2. Disconnect the reverse inhibit solenoid. 3. Turn ON the ignition, with the engine OFF. 4. Probe the battery positive voltage circuit of the reverse inhibit solenoid with a test lamp that is connected to ground. Does the test lamp illuminate?	Go to **Step 5**	Go to **Step 11**
	1. Connect a test lamp between the control circuit of the reverse inhibit solenoid and the battery positive voltage circuit of the		

5	reverse inhibit solenoid. 2. With a scan tool, command the reverse inhibit solenoid ON and OFF. Does the test lamp turn ON and OFF?	Go to **Step 9**	Go to **Step 6**
6	Does the test lamp remain illuminated with each command?	Go to **Step 8**	Go to **Step 7**
7	Test the control circuit of the reverse inhibit solenoid for a short to voltage or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 10**
8	Test the control circuit of the reverse inhibit solenoid for a short to ground. Refer to **Testing for Short to Ground** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 10**
9	Inspect for poor connections at the reverse inhibit solenoid. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 12**
10	Inspect for poor connections at the harness connector of the ECM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 13**
11	Test the battery positive voltage circuit of the reverse inhibit solenoid for an open or short to ground. Refer to **Wiring Repairs** .		-

	Did you find and correct the condition?	Go to **Step 14**	
12	Replace the reverse inhibit solenoid. Refer to **Gear Select/Skip Shift Solenoid Replacement**. Did you find and correct the condition?	Go to **Step 14**	-
13	Replace the ECM. Refer to **Control Module References** for replacement, setup, and programming. Did you complete the replacement?	Go to **Step 14**	-
14	Perform the following procedure in order to verify the repair: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle. 4. Select Specific DTC. 5. Enter DTC P0801. Has the test run and passed?	Go to **Step 15**	Go to **Step 2**
15	With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	System OK

DTC P0803

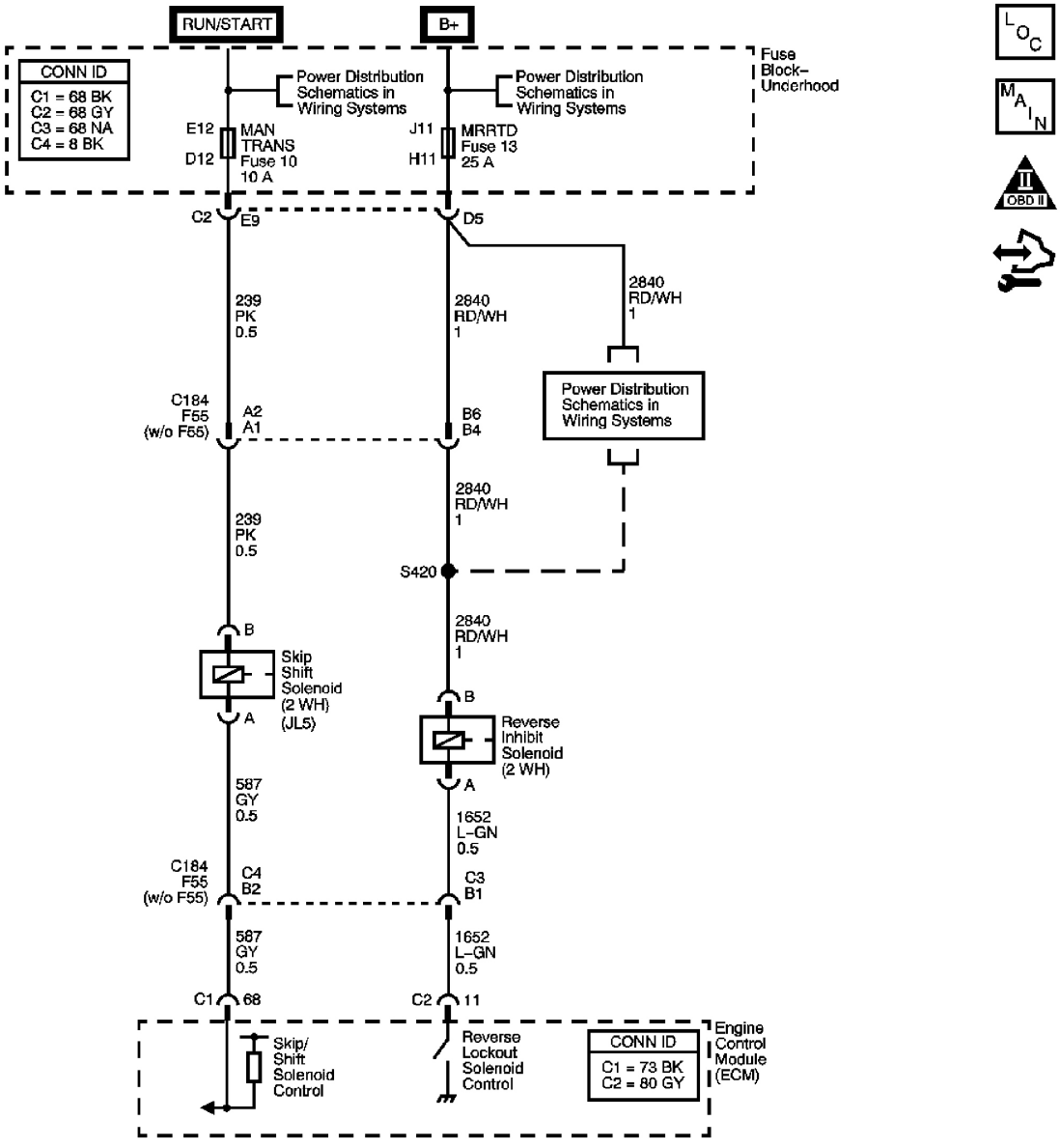


Fig. 21: DTC P0803 Wiring Diagram
Courtesy of GENERAL MOTORS CORP.

Circuit Description

With the ignition ON battery voltage is supplied directly to the skip shift solenoid. The engine control module (ECM) controls the solenoid by grounding the control circuit via an internal switch called a driver. The driver supplies the ground for the component being controlled. Each driver has a fault line which the ECM monitors. When the ECM commands a component ON, the voltage of the control circuit should be low, near 0 volts. When the ECM commands the control circuit to a component OFF, the voltage potential of the circuit should be high, near battery

voltage. If the internal fault detection circuit senses a voltage other than what is expected, the fault line status changes, causing DTC P0803 to set. DTC P0803 is a type B DTC.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0803 Skip Shift Solenoid Control Circuit

Conditions for Enabling the 1-4 Upshift Solenoid

- The VSS is between 24-31 km/h (15-19 mph).
- The ECT is 77°C (171°F) or greater.
- The BARO is greater than 76 kPa.
- The accelerator pedal position (APP) is less than 21 percent.
- Once the 1-4 Upshift solenoid is enabled the solenoid will not be re-enabled until the vehicle speed returns to 1 km/h (1 mph) and the conditions for enabling the 1-4 Upshift solenoid are met.

Conditions for Running the DTC

The engine is running.

Conditions for Setting the DTC

- The ECM detects that the commanded state of the driver and the actual state of the control circuit do not match.
- Condition must exist for a minimum of 5 seconds.

Action Taken When the DTC Sets

- The ECM illuminates the malfunction indicator lamp (MIL) on the second consecutive trip that the diagnostic runs and fails.
- The ECM disables cruise control.
- The ECM records the operating conditions at the time when the Conditions for Setting the DTC are met. The ECM stores this information as Freeze Frame and Failure Records.
- The ECM stores DTC P0803 in ECM history.

Conditions for Clearing the MIL/DTC

- The ECM turns OFF the MIL during the third consecutive trip in which the diagnostic test

runs and passes.

- A scan tool can clear the MIL/DTC.
- The ECM clears the DTC from ECM history if the vehicle completes 40 warm-up cycles without an emission-related diagnostic fault occurring.
- The ECM cancels the DTC default actions when the fault no longer exists and the DTC passes.

Diagnostic Aids

- Remove any debris from the ECM connector surfaces before servicing the ECM. Inspect the ECM connector gaskets when diagnosing/replacing the ECM. Ensure that the gaskets are installed correctly. The gaskets prevent contaminate intrusion into the ECM.
- For any test that requires probing the ECM or a component harness connector, use the **J 35616** connector test adapter kit. Using this kit prevents damage to the harness/component terminals. Refer to **Using Connector Test Adapters** .
- Low system voltage can cause this DTC to set. When reviewing captured data, verify if a low system voltage condition was present at the time the DTC was stored in memory.
- For an intermittent condition, refer to **Testing for Intermittent Conditions and Poor Connections** .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: Listen for an audible click when the skip shift solenoid operates. Command both the ON and OFF states. Repeat the commands as necessary.

4: Tests for voltage at the coil side of the skip shift solenoid. The ENG IGN1 fuse supplies power to the coil side of the skip shift solenoid.

5: Verifies that the ECM is providing ground to the skip shift solenoid.

6: Tests if ground is constantly being applied to the skip shift solenoid.

DTC P0803

Step	Action	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
	1. Install a scan tool. 2. Turn ON the ignition, with the		

2	engine OFF. **IMPORTANT:** **Record the Freeze Frame and Failure Records before clearing the DTCs. Using the Clear Info function erases the Freeze Frame and Failure Records from the ECM.** 3. With a scan tool, command the skip shift solenoid ON and OFF. Does the skip shift solenoid turn ON and OFF?	Go to **Step 3**	Go to **Step 4**
3	1. Observe the Freeze Frame and/or Failure records data for this DTC. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text or as close to the Freeze Frame and/or Failure records data that you observed. Does the DTC fail this ignition?	Go to **Step 4**	Go to **Testing for Intermittent Conditions and Poor Connections**
4	1. Turn OFF the ignition. 2. Disconnect the skip shift solenoid. 3. Turn ON the ignition, with the engine OFF. 4. Probe the ignition 1 voltage circuit of the skip shift solenoid with a test lamp that is connected to a good ground. Does the test lamp illuminate?	Go to **Step 5**	Go to **Step 11**
	1. Connect a test lamp between the		

5	control circuit of the skip shift solenoid and the ignition 1 voltage circuit of the skip shift solenoid. 2. With a scan tool, command the skip shift solenoid ON and OFF. Does the test lamp turn ON and OFF?	Go to **Step 9**	Go to **Step 6**
6	Does the test lamp remain illuminated with each command?	Go to **Step 8**	Go to **Step 7**
7	Test the control circuit of the skip shift solenoid for a short to voltage or an open. Refer to **Circuit Testing** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 10**
8	Test the control circuit of the skip shift solenoid for a short to ground. Refer to **Testing for Short to Ground** and **Wiring Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 10**
9	Inspect for poor connections at the skip shift solenoid. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 12**
10	Inspect for poor connections at the harness connector of the ECM. Refer to **Testing for Intermittent Conditions and Poor Connections** and **Connector Repairs** . Did you find and correct the condition?	Go to **Step 14**	Go to **Step 13**
11	Repair the ignition 1 voltage circuit of the skip shift solenoid. Refer to **Wiring Repairs** . Did you complete the repair?	Go to **Step 14**	-
12	Replace the skip shift solenoid. Refer to **Gear Select/Skip Shift Solenoid Replacement**. Did you complete the replacement?	Go to **Step 14**	-
	Replace the ECM. Refer to **Control**		

13	**Module References** for replacement, setup, and programming. Did you complete the replacement?	Go to **Step 14**	-
14	Perform the following procedure in order to verify the repair: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle with the APP angle below 21%. 4. Select Specific DTC. 5. Enter DTC P0803. Has the test run and passed?	Go to **Step 15**	Go to **Step 2**
15	With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	System OK

DTC P0833

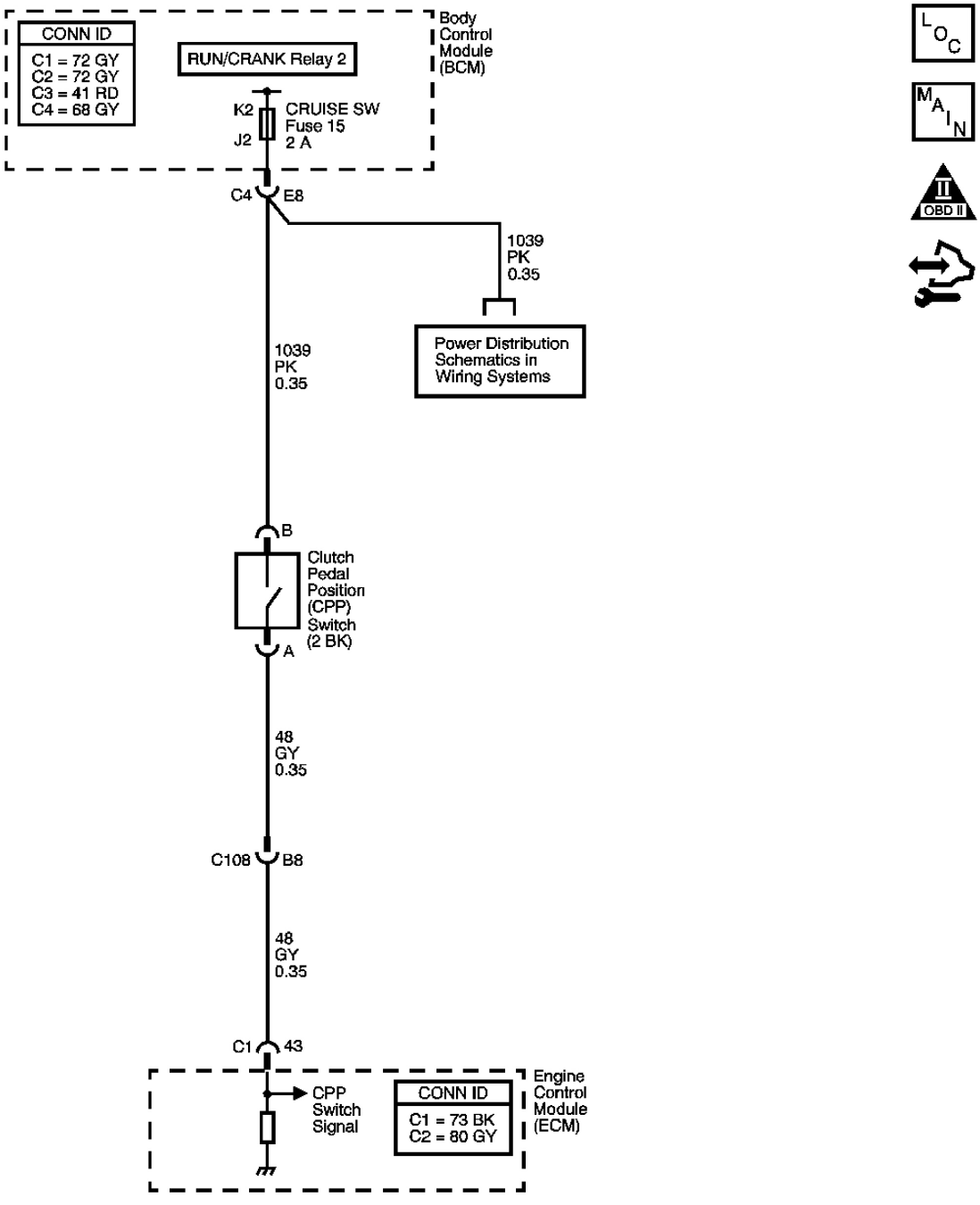


Fig. 22: DTC P0833 - Wiring Diagram
Courtesy of GENERAL MOTORS CORP.

Circuit Description

Battery voltage is supplied from the Engine Ignition 1 fuse to the clutch switch. The clutch switch is a normally closed switch. When the clutch pedal is released, the clutch pedal position (CPP)

switch signal circuit is pulled up to B+. When the clutch pedal is applied, the switch opens, and the voltage drops to 0 volts.

If the engine control module (ECM) detects a specified number of vehicle speed transitions without detecting a clutch switch transition, DTC P0833 sets. DTC P0833 is a type B DTC.

DTC Descriptor

This diagnostic procedure supports the following DTC:

DTC P0833 Clutch Pedal Switch 2 Circuit

Conditions for Running the DTC

No VSS DTC P0502 and P0503.

Conditions for Setting the DTC

- The vehicle speed goes from 0 km/h (0 mph) to greater than 39 km/h (24 mph) and back to 0 km/h (0 mph) for 2 seconds without the ECM detecting a clutch transition.
- This must occur 7 times before the diagnostic reports a fault.

Action Taken When the DTC Sets

- The ECM illuminates the malfunction indicator lamp (MIL) during the second consecutive trip in which the Conditions for Setting the DTC are met.
- Cruise control is disabled.
- The ECM records the operating conditions at the time when the Conditions for Setting the DTC are met. The ECM stores this information as Freeze Frame and Failure Records.
- The ECM stores DTC P0833 in ECM history.

Conditions for Clearing the MIL/DTC

- The ECM turns OFF the MIL during the third consecutive trip in which the diagnostic test runs and passes.
- A scan tool can clear the MIL/DTC.
- The ECM clears the DTC from ECM history if the vehicle completes 40 warm-up cycles without an emission-related diagnostic fault occurring.
- The ECM cancels the DTC default actions when the fault no longer exists and the DTC passes.

Diagnostic Aids

IMPORTANT:

- **Remove any debris from the ECM connector surfaces before servicing the ECM. Inspect the ECM connector gaskets when diagnosing/replacing the module. Ensure that the gaskets are installed correctly. The gaskets prevent contaminate intrusion into the ECM.**
- **For any test that requires probing the ECM or a component harness connector, use the J 35616 GM terminal test kit. Using this kit prevents damage to the harness/component terminals. Refer to Using Connector Test Adapters .**

For clutch switch adjustment refer to **Clutch Pedal Position Switch Replacement** .

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This test confirms if the scan tool is receiving a clutch switch position signal.
3: This step inspects the clutch pedal connector and adjustment.
4: This step tests for a short to ground.
5: This step tests for voltage to the fuse.
6: This step tests for voltage to the CPP switch.
7: This step tests the CPP switch.
8: This step tests the CPP switch signal circuit.
9: This step tests the Ignition 1 Voltage circuit for a short to ground.
10: This step tests the CPP switch signal circuit for a ground.
17: This step ensures that the technician has verified the system is operating normally.

DTC P0833

Step	Action	Values	Yes	No
1	Did you perform the Diagnostic System Check - Vehicle?	-	Go to **Step 2**	Go to **Diagnostic System Check - Vehicle**
	1. Install a scan tool. 2. Turn ON the ignition, with the engine OFF.			

2	**IMPORTANT:** **Before clearing the DTC, use the scan tool in order to record the Freeze Frame and Failure Records. Using the Clear Info function erases the Freeze Frame and Failure Records from the ECM.** 3. Record the DTC Freeze Frame and Failure Records. 4. Clear the DTC. 5. Use the scan tool to monitor the CPP Switch parameter under Engine Data List. 6. Apply and release the clutch pedal several times. Does the scan tool indicate a change in state when the clutch pedal is either applied or released?	-	Go to **Testing for Intermittent Conditions and Poor Connections**	Go to **Step 3**
3	Inspect the adjustment of the CPP switch and the connector. Refer to **Clutch Pedal Cruise Control Release Switch Replacement** . Does the clutch switch require adjustment or the connector require service?	-	Go to **Step 11**	Go to **Step 4**
4	Inspect the cruise switch fuse. Is the cruise switch fuse open?	-	Go to **Step 9**	Go to **Step 5**
5	1. Start the vehicle. 2. Using a DMM, measure voltage at the cruise switch fuse in the underhood fuse block. Does the DMM indicate the specified value?	B+	Go to **Step 6**	Go to **Step 12**
	1. Turn OFF the ignition.			

6	2. Disconnect the CPP switch connector. 3. Start the vehicle. 4. Using a DMM, measure the voltage at the Ignition 1 Voltage circuit. Does the DMM indicate the specified value?	B+	Go to **Step 7**	Go to **Step 13**
7	1. Use the scan tool to monitor the CPP Switch parameter. 2. Put the transmission in Neutral. 3. Apply the parking brake. 4. Start the vehicle. 5. Use a fused jumper wire to repeatedly connect and disconnect pin A and pin B of the CPP switch electrical connector. Does the scan tool parameter display applied and released?	-	Go to **Step 15**	Go to **Step 8**
8	1. Turn the ignition switch OFF. 2. Disconnect C1 at the ECM. 3. Using the DMM, test for continuity and a short to voltage on the CPP switch signal circuit. Did you find a short to voltage, high resistance or an open on the CPP switch signal circuit?	-	Go to **Step 14**	Go to **Step 16**
	1. Turn the ignition switch OFF. 2. Remove the cruise switch fuse. 3. Disconnect the CPP switch connector and C1 at the ECM.			

9	4. Using a DMM, test for a short to ground on the Ignition 1 Voltage circuit at the switch connector. Is the Ignition 1 Voltage circuit grounded?	-	Go to **Step 13**	Go to **Step 10**
10	Using a DMM, test for a short to ground on the CPP switch signal circuit at the switch connector. Is the CPP switch signal circuit grounded?	-	Go to **Step 14**	Go to **Step 15**
11	Adjust the CPP switch or repair the connector as necessary. Refer to **Clutch Pedal Cruise Control Release Switch Replacement** . Did you complete the repair?	-	Go to **Step 17**	-
12	**IMPORTANT:** **Voltage to this fuse is run through the Ignition relay. Refer to Power Distribution Schematics .** Repair the Power Distribution circuit to the cruise switch fuse.Did you complete the repair?	-	Go to **Step 17**	-
13	Repair the open, high resistance or short to ground in the Ignition 1 Voltage circuit or a parallel circuit that uses the fuse. Did you complete the repair?	-	Go to **Step 17**	-
14	Repair the open, high resistance or short in the CPP switch signal circuit. Did you complete the repair?	-	Go to **Step 17**	-
15	Replace the CPP switch. Refer to **Clutch Pedal Position Switch Replacement** . Is the action complete?	-	Go to **Step 17**	-
	Replace the ECM. Refer to **Control Module References** for			

16	replacement, setup, and programming. Is the action complete?	-	Go to **Step 17**	-
17	Perform the following procedure in order to verify the repair: 1. Select DTC. 2. Select Clear Info. 3. Operate the vehicle from 0 km/h (0 mph) to above 38 km/h (24 mph) then back to 0 km/h (0 mph) 7 times. 4. Select Specific DTC. 5. Enter DTC P0833. Has the test run and passed?	-	Go to **Step 18**	Go to **Step 2**
18	With the scan tool, observe the stored information, capture info and DTC info. Does the scan tool display any DTCs that you have not diagnosed?	-	Go to **Diagnostic Trouble Code (DTC) List - Vehicle**	System OK

SYMPTOMS - MANUAL TRANSMISSION

Strategy Based Diagnostics

Review the system operations in order to familiarize yourself with the system functions. Refer to **Manual Transmission Description and Operation**.

Visual/Physical Inspection

- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the manual transmission for the correct fluid level.
- Inspect the manual transmission for fluid leaks.
- Inspect the manual transmission for broken or loose transmission mounts.

Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating properly.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Transmission Shifts Hard**
- **Transmission Gear Clash When Shifting Gears**
- **Transmission Noisy**
- **Transmission Jumps Out of Gear**
- **Transmission Does Not Shift into One Gear**
- **Transmission Locked in One Gear**
- **Transmission Clunk on Acceleration or Deceleration**
- **Transmission Fluid Leak Diagnosis**

TRANSMISSION SHIFTS HARD

Diagnostic Aids

An intermittent hard shift may be caused by an intermittent clutch condition. With a self adjusting clutch, the clutch may be in between adjustments and not give full clutch release. This might be felt by a low clutch pedal. After several applications, the clutch may adjust properly to give the proper pedal feel.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3: A static shift test is performed by shifting into all of the gear positions with the engine not operating. While performing the test one should note how the shift lever movement is felt. Also while shifting from one gear to the other feel for binding in the shift rails. You should be able to feel the detent plungers operating when coming out of a gear and going into a gear.

6: A dynamic shift test is performed by shifting into of the gear positions with the engine operating. Test for the correct mesh of the synchronizers and for the clutch releasing correctly. When shifting into a gear and out of the gear feel the shift detent plungers and for the synchronizers sleeve for moving freely.

8: The transmission uses transmission fluid that allows proper synchronizer operation. The incorrect fluid may cause hard shifting, from varnish build up or not enough lubrication for proper synchronizer operation. Refer to **Lubrication Specifications**.

Transmission Shifts Hard

Step	Action	Yes	No
DEFINITION: The transmission does not shift smoothly or without difficulty from one gear to the other.			
1	Did you review the **Symptoms - Manual Transmission** operations and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	Inspect the clutch system for proper operation. Refer to **Clutch System Description and Operation** . Did you find or repair the condition?	Go to **Step 12**	Go to **Step 3**
3	1. Perform a static shift test on the transmission. 2. Test for the following conditions: • Blockage preventing full shift lever movement • Excessive movement in the shift lever • Binding in the shift lever • Detent plungers or shift rails binding • Shift linkage binding • Shift linkage proper adjustment Are you able to shift into all gears?	Go to **Step 8**	Go to **Step 4**
4	Remove the shift control shift closeout boot. Refer to **Shift Control Shift Closeout Boot Replacement**. Inspect for the following: • Loose mounting • Foreign debris Did you find and repair the condition?	Go to **Step 12**	Go to **Step 5**

5	Inspect for proper shift linkage adjustment. Refer to **Shift Linkage Adjustment**. Did you find and repair the condition?	Go to **Step 12**	Go to **Step 6**
6	1. Perform a dynamic shift test on the transmission. 2. Test for the following conditions: • Detent plungers or shift rails binding • Synchronizer sleeve binding • Gear clash into only one gear • Gear clash into all gears Did the transmission shift hard into all gears?	Go to **Step 7**	Go to **Step 11**
7	Inspect the transmission for the correct fluid level and the correct type of transmission fluid. Refer to **Transmission Fluid Replacement**. Is the transmission at the correct level and proper fluid being used?	Go to **Step 9**	Go to **Step 8**
8	Drain and fill the transmission with the correct type fluid. Refer to **Transmission Fluid Replacement**. Did you find and repair the condition?	Go to **Step 12**	Go to **Step 9**
9	Remove the transmission. Refer to **Transmission Replacement**. Inspect the clutch pressure plate and/or clutch driven plate. Is the clutch pressure plate and/or clutch driven plate worn or faulty?	Go to **Step 10**	Go to **Step 11**
10	Replace the clutch assembly. Refer to **Clutch Assembly Replacement** . Did you find and repair the condition?	Go to **Step 12**	Go to **Step 11**
	1. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 2. Inspect the transmission for the following faulty components in the gear that is hard to shift or clashing: • Excessive synchronizers blocking		

11	ring to gear clearance • Synchronizer hub external splines worn or damaged • Excessive axial clearance in the speed gear • Mainshaft to speed gear bearing or journal worn • Shift rail and the internal shift control lever components for wear or damage 3. Replace worn or damaged components as necessary. Did you find and repair the condition?	Go to **Step 12**	Go to Diagnostic Aids
12	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

TRANSMISSION GEAR CLASH WHEN SHIFTING GEARS

Diagnostic Aids

Gear clashing may be caused by shifting at too high of an engine RPM or by rushing the shift. If gear clashing is occurring in more than one gear, the clutch may not be releasing properly for proper synchronizer operation.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This step tests for the proper release of the clutch. If the clutch reserve is not correct, the mainshaft gears may be turning, causing the gear to clash.

5: This step inspects for the proper transmission fluid. The proper fluid is required for the correct lubrication of the synchronizers.

7: A static shift test is performed by shifting into all of the gear positions with the engine not operating. While performing the test, you should note how the shift lever movement feels. Also, while shifting from one gear to another, feel for binding in the shift rails. You should be able to feel the detent plungers operating when coming out of a gear and going into a gear. Excessive play in the gear shift lever may prevent the shift forks from fully engaging the synchronizer.

10: A dynamic shift test is performed by shifting into all of the gear positions with the engine operating. Test for the correct mesh of the synchronizers and for the clutch releasing correctly. Move the shift lever and feel for the synchronizer sleeve to just release from the gear then let up on the clutch pedal. Depress the clutch pedal and move the shift lever to engage that gear again. If the transmission shifts back into the gear without clashing, the clutch is releasing correctly and the synchronizer is operating. If clashing occurs, test another gear. If all gears clash, the clutch is not releasing correctly.

Transmission Gear Clash When Shifting Gears

Step	Action	Yes	No
DEFINITION: Noise from the transmission when shifting gears. A grinding or grating sound when the synchronizer sleeve is engaging with the selector teeth on the speed gear. A suspected internal transmission condition if the noise is only happens in one gear.			
1	Did you review the **Symptoms - Manual Transmission** and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	With the engine operating, does the transmission shift from neutral to any gear without the vehicle lurching or gear clashing?	Go to **Step 5**	Go to **Step 3**
3	Inspect for proper clutch operation. Refer to **Clutch System Description and Operation** . Does the clutch operate properly?	Go to **Step 5**	Go to **Step 4**
4	Repair the clutch system. Refer to **Symptoms - Clutch** . Did you find and repair the condition?	Go to **Step 12**	Go to **Step 5**
5	Inspect for the correct transmission fluid level and for the correct fluid. Refer to **Transmission Fluid Replacement**. Is the transmission fluid level correct and at the correct level?	Go to **Step 7**	Go to **Step 6**
6	Fill the transmission to the correct level or change the fluid if it is the incorrect type. Does the transmission still have gear clash?	Go to **Step 7**	Go to **Step 12**
	1. Perform a static shift test on the transmission. 2. Test for the following conditions: • Blockage preventing full shift lever movement		

7	• Excessive movement in the shift lever • Binding in the shift lever • Detent plungers or shift rails binding • Shift linkage binding • Shift linkage proper adjustment Did the transmission shift smoothly into the gear that is clashing?	Go to **Step 10**	Go to **Step 8**
8	1. Remove the shift lever. 2. Inspect for damaged or worn components. Refer to **Shift Control Assembly Replacement**. Did you find and repair the condition?	Go to **Step 12**	Go to **Step 9**
9	Inspect for proper shift linkage adjustment. Refer to **Shift Linkage Adjustment**. Did you find and repair the condition?	Go to **Step 12**	Go to **Step 10**
10	1. Perform a dynamic shift test on the transmission. 2. Test for the following conditions: • Detent plungers or shift rails binding • Synchronizer sleeve binding • Gear clashing in more than the suspected gear Is the transmission hard to shift into all gears?	Go to **Transmission Shifts Hard**	Go to **Step 11**
	1. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 2. Inspect the following transmission components for the suspect gear that is clashing: • Excessive synchronizer blocking ring to gear clearance • Synchronizer sleeve to hub lash or		

11	rock excessive • Excessive axial clearance in the speed gear • Mainshaft to speed gear bearing or journal worn • Shift fork worn or damaged • Internal shift control worn or damaged • Mainshaft bearing worn or damaged • Input gear bearing or pilot bearing worn Did you find and repair the condition?	Go to **Step 12**	Go to Diagnostic Aids
12	Operate the system and verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

TRANSMISSION NOISY

Diagnostic Aids

If the transmission is in neutral with the engine operating, and a whirling noise - neutral gear rattle - is heard outside the vehicle, this is a normal condition.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

5: This step inspects for the correct transmission fluid level. If the transmission fluid level is excessively low, damage may have occurred to the transmission components.

7: This step inspects for the correct type of transmission fluid. If the incorrect fluid was used, there may have been an overheating condition. Overheating may cause damage to the transmission components.

9: This step inspects for noise coming into the driver compartment. Improper sealing of the shift tower may be allowing normal transmission noise to be heard by the driver.

13: This step tests to determine if clutch components are making the noise. Depress the clutch pedal slowly and listen for the change in noise. If the noise changes while pressing the pedal, it may be a faulty clutch component. If the noise does not change until the clutch is completely disengaged, the transmission component is faulty.

Transmission Noisy

Step	Action	Yes	No
DEFINITION: The transmission is making a noise. The noise may be a whine or a growl caused by faulty bearings or gears. The noise may also be caused from a faulty component causing a vibration noise.			
1	Did you review the **Symptoms - Manual Transmission** operations and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	Is the noise present while in neutral, with the engine operating?	Go to Diagnostic Aids	Go to **Step 3**
3	Is the noise present in all gears?	Go to **Step 5**	Go to **Step 4**
4	Is the noise present in just one gear?	Go to **Step 15**	Go to **Step 5**
5	Inspect the transmission fluid level. Is the fluid level correct?	Go to **Step 7**	Go to **Step 6**
6	Add transmission fluid. Refer to **Transmission Fluid Replacement**. Did you find and repair the condition?	Go to **Step 16**	Go to **Step 7**
7	Inspect the transmission for the correct fluid type. Refer to **Lubrication Specifications**. Is the transmission fluid the correct type?	Go to **Step 9**	Go to **Step 8**
8	Drain and fill the transmission with the correct type of fluid. Refer to **Transmission Fluid Replacement**. Did you find and repair the condition?	Go to **Step 16**	Go to **Step 9**
9	Inspect the shift tower boot. Is the closeout boot loose or damaged?	Go to **Step 10**	Go to **Step 11**
10	Position and tighten the shift tower boot to specifications. Refer to **Transmission Control Boot Replacement**. Did you find and repair the condition?	Go to **Step 16**	Go to **Step 11**
11	Inspect for torque tube to transmission alignment and loose transmission mounting bolts. Are there any loose transmission mounting bolts?	Go to **Step 12**	Go to **Step 15**
12	Replace and tighten the transmission mounting bolts. Refer to **Fastener Tightening Specifications**.		

	Is the noise still present?	Go to **Step 13**	Go to **Step 16**
13	With the engine operating, depress the clutch pedal. Is the noise still present?	Go to **Step 14**	Go to **Step 15**
14	1. Remove the clutch. Refer to **Clutch Assembly Replacement** . 2. Inspect the following components for being the cause of the noise: • The release bearing • The pilot bearing • The dual mass flywheel, if equipped • The pressure plate • The clutch disc • The input shaft bearing • The engine crankshaft end play Did you find and repair the condition?	Go to **Step 16**	Go to **Step 15**
15	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. Use the information in the Cleaning and Inspection section to determine if any of the transmission components are faulty. Did you find and repair the condition?	Go to **Step 16**	-
16	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

TRANSMISSION JUMPS OUT OF GEAR

Diagnostic Aids

If the transmission jumps out of gear during deceleration, inspect the components that may allow for the gears or shafts to tip. If the gears or shafts tip, the synchronizer sleeve can disengage from the selector teeth on the speed gear. If the transmission jumps out of gear during acceleration, inspect the components that may not allow full engagement of the synchronizer sleeve to the

selector teeth on the speed gear. Insufficient engagement of the selector teeth under torque may cause the transmission to jump out of gear.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: A static shift test is performed by shifting into all gear positions with the engine not operating. While performing the test, slowly move the shift lever. Feel for proper movement of the shift lever and transmission internal shift components.

5: A dynamic shift test is performed by shifting into all gear positions with the engine operating. Test for the correct mesh of the synchronizers sleeve and the speed gear selector teeth. Move the shift lever, and feel for the synchronizer sleeve to release from the gear, then let up on the clutch pedal. Depress the clutch pedal and move the shift lever to engage the gear again, to ensure full travel of the shift components.

6: This step inspects for worn or damaged transmission or engine mounts. Loose mounts may cause a shock on the transmission allowing for gear disengagement.

7: This step inspects for the misalignment of the torque tube to transmission. Misalignment may put a bind on the input shaft, allowing for the input shaft or the mainshaft to tip.

9: This step inspects the pilot bearing and the pilot bearing journal on the input shaft. A worn pilot bearing or input shaft may allow the input shaft to tip, causing gear disengagement.

Transmission Jumps Out of Gear

Step	Action	Yes	No
DEFINITION: Gear disengagement occurs during acceleration or deceleration.			
1	Did you review the **Symptoms - Manual Transmission** operations and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	1. Perform a static shift test. 2. Test for the following conditions: • Blockage preventing full shift lever movement • Excessive movement in the shift lever • Detent plungers engaging in the shift rails • Synchronizer pressure pieces on the		

	synchronizer sleeves • Shift linkage binding • Shift linkage proper adjustment Did the transmission shift completely into all gears?	Go to **Step 5**	Go to **Step 3**
3	Remove the shift control shift closeout boot. Refer to **Shift Control Shift Closeout Boot Replacement**. Inspect for the following: • Loose mounting • Foreign debris Did you find and repair the condition?	Go to **Step 11**	Go to **Step 4**
4	Inspect for proper shift linkage adjustment. Refer to **Shift Linkage Adjustment**. Did you find and repair the condition?	Go to **Step 11**	Go to **Step 5**
5	1. Perform a dynamic shift test on the transmission. 2. Test for the following conditions: • Synchronizer sleeve engagement to the speed gear selector teeth • Detent plungers engaging in the shift rails Did the transmission shift completely into all gears?	Go to **Step 6**	Go to **Step 9**
6	Inspect the engine and/or transmission mounts. Refer to **Transmission Mount Replacement** and **Engine Mount Inspection** . Did you find and repair the condition?	Go to **Step 11**	Go to **Step 7**
7	Inspect the clutch housing for loose bolts or misalignment. Are there any loose bolts or misalignment?	Go to **Step 10**	Go to **Step 9**
	Tighten any loose housing bolts and/or align the housing. Refer to **Clutch Assembly**		

8	**Replacement** . Did you find and repair the condition?	Go to **Step 11**	Go to **Step 9**
9	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Remove the clutch assembly. Refer to **Clutch Assembly Replacement** . 3. Inspect the pilot bearing for being faulty. 4. Inspect the input shaft for excessive wear at the pilot bearing. Did you find and repair the condition?	Go to **Step 11**	Go to **Step 10**
10	1. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 2. Inspect the following components for wear or damage: • The shift rails • The detent plungers and springs • The shift forks • The synchronizer sleeve and speed gear selector teeth • The mainshaft to input shaft bearing and journals • The speed gear bearings and journals • The speed gear axial clearance • The mainshaft center and rear bearings Did you find and repair the condition?	Go to **Step 11**	Go to Diagnostic Aids
11	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

TRANSMISSION DOES NOT SHIFT INTO ONE GEAR

Diagnostic Aids

If the transmission shifts into gear and then jumps out of gear, refer to **Transmission Jumps Out**

of Gear. If it is an intermittent condition, other driveline components may be faulty.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This test is to confirm that the clutch is not slipping. During certain conditions, the clutch may slip and feel as though the transmission is not in gear.

3: A static shift test is performed by shifting into all gears with the engine not operating. While performing the test, you should note how the shift lever movement feels. Also feel for the shift rails moving freely, the detent plungers operating when coming out of a gear and going in the next gear, and the synchronizer sleeve movement.

6: A dynamic shift test is performed by shifting into all gears with the engine operating. Test for the correct mesh of the synchronizers sleeve and the speed gear selector teeth. Move the shift lever and feel for the synchronizer sleeve to just release from the gear, then let up on the clutch pedal. Depress the clutch pedal and move the shift lever to engage that gear again, to ensure full travel of the shift components.

Transmission Does Not Shift into One Gear

Step	Action	Yes	No
DEFINITION: The shift lever will not move into a particular gear position, or when in a gear position, power is not delivered through the transmission.			
1	Did you review the **Symptoms - Manual Transmission** and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	Inspect the clutch system for slipping. Refer to **Clutch Slipping** . Is the clutch operating properly?	Go to **Step 2**	Go to **Clutch Assembly Replacement**
3	1. Perform a static shift test on the transmission. 2. Test for the following conditions: • Blockage preventing full shift lever movement • Excessive movement in the shift lever • Binding in the shift lever • Detent plungers or shift rails binding • Synchronizer sleeve moving on the hub and pressure pieces		

	• Shift linkage binding • Shift linkage proper adjustment Were you able to shift into the gear position with the concern?	Go to **Step 6**	Go to **Step 4**
4	Remove the shift control shift closeout boot. Refer to **Shift Control Shift Closeout Boot Replacement**. Inspect for the following: • Loose mounting • Foreign debris Did you find and repair the condition?	Go to **Step 9**	Go to **Step 5**
5	Inspect for proper shift linkage adjustment. Refer to **Shift Linkage Adjustment**. Did you find and repair the condition?	Go to **Step 9**	Go to **Step 6**
6	1. Perform a dynamic shift test on the transmission. 2. Test for the following conditions: • Detent plungers or shift rails binding • Synchronizer sleeve binding • Synchronizer sleeve engaging on the speed gear selector teeth Were you able to shift into the gear position with the concern?	Go to **Step 8**	Go to **Step 7**
7	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 3. Inspect the following transmission internal components for wear or damage: • The shift forks		

	• The internal shift control lever Did you find and repair the condition?	Go to **Step 9**	Go to **Step 8**
8	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 3. Inspect the following transmission internal components for wear or damage: • The synchronizer sleeve selector teeth • The speed gear selector teeth • The speed gear axial clearance for being excessive • The speed gear to mainshaft bearings and journals • The countershaft for being broken • The mainshaft for being broken • The countershaft gear for being stripped • The mainshaft gear for being stripped Did you find and repair the condition?	Go to **Step 9**	Go to Diagnostic Aids
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

TRANSMISSION LOCKED IN ONE GEAR

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This step is to ensure the use of the proper transmission fluid. The transmission fluid is used to ensure proper synchronizer operation, and for sufficient lubrication. Improper fluid may cause the synchronizers to stick or cause overheating of the transmission components.

4: A static shift test is performed by shifting into all gears with the engine not operating. By

confirming that the transmission can be shifted into all positions, ensures that the shift lever is not excessively worn or damaged.

6: A dynamic shift test is performed by shifting into all of the gear positions with the engine operating. Test to ensure that the internal shift components are properly functioning.

Transmission Locked in One Gear

Step	Action	Yes	No
DEFINITION: The transmission cannot be shifted out of a gear or the vehicle will not move because the transmission is locked.			
1	Did you review the **Symptoms - Manual Transmission** and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	Inspect for the correct type of transmission fluid. Refer to **Lubrication Specifications**. Is the correct type of transmission fluid being used?	Go to **Step 6**	Go to **Step 5**
3	Drain and fill the transmission with the correct type of fluid. Refer to **Transmission Fluid Replacement**. Did you find and repair the condition?	Go to **Step 9**	Go to **Step 6**
4	1. Perform a static shift test on the transmission. 2. Test for the shift lever moving to all positions. Were you able to shift into all positions?	Go to **Step 6**	Go to **Step 5**
5	1. Remove the shift lever. Refer to **Shift Control Assembly Replacement**. 2. Inspect for worn or faulty components. Did you find and repair the conditions?	Go to **Step 9**	Go to **Step 6**
6	1. Perform a dynamic shift test on the transmission. 2. Test for being able to shift in and out of the gear with the concern. Were you able to shift the transmission		

	correctly?	Go to **Step 7**	Go to **Step 8**
7	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Inspect the clutch system for the clutch not releasing properly. Refer to **Clutch System Description and Operation** . Did you find and repair the condition?	Go to **Step 9**	Go to **Step 8**
8	1. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 2. Inspect the following transmission internal components for wear or damage: • The shift rail • The internal shift control lever • The synchronizer components for being broken or faulty • The speed gears for being seized to the mainshaft Did you find and repair the conditions?	Go to **Step 9**	Go to Diagnostic Aids
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

TRANSMISSION CLUNK ON ACCELERATION OR DECELERATION

Diagnostic Aids

All manual transmissions have gear play that might cause a clunk. If the transmission is suspected of causing the clunk, compare it with a similar vehicle. An internal clunk in the transmission is usually caused by wear between two components, or from improper assembly, which would also cause other symptoms.

Test Description

The number below refers to the step number on the diagnostic table.

5: This step inspects the driveline components that may be the cause of the clunk noise. The

noise may resonate to the transmission.

Transmission Clunk on Acceleration or Deceleration

Step	Action	Yes	No
DEFINITION: A clunk is heard and/or felt on acceleration or deceleration.			
1	Did you review the **Symptoms - Manual Transmission** and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	Inspect the engine mounts for being loose or damaged. Refer to **Engine Mount Inspection** . Did you find and repair the condition?	Go to **Step 7**	Go to **Step 3**
3	Inspect the transmission mounts for being loose or damaged. Refer to **Transmission Mount Replacement** . Did you find and repair the condition?	Go to **Step 7**	Go to **Step 4**
4	Inspect the transmission to engine fasteners for being loose or missing. Refer to **Fastener Tightening Specifications**. Did you find and repair the condition?	Go to **Step 7**	Go to **Step 5**
5	Inspect the driveline for causing the clunk. Refer to **Diagnostic Starting Point - Propeller Shaft** . Did you find and repair the condition?	Go to **Step 7**	Go to **Step 6**
6	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 3. Inspect the following transmission components that maybe causing the clunk: • Faulty mainshaft bearings • Faulty countershaft bearings • Worn speed gear teeth • Worn countershaft gear teeth • Worn synchronizer sleeve to hub • Worn thrust washers and thrust		

	surfaces on the speed gears or mainshaft Did you find and repair the condition?	Go to **Step 7**	Go to Diagnostic Aids
7	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

TRANSMISSION FLUID LEAK DIAGNOSIS

Diagnostic Aids

Using the incorrect type of transmission fluid may affect the sealing ability of the seals. Ensure the use of the correct type of transmission fluid. The incorrect type of sealer may not be compatible with the transmission fluid or may not have the correct characteristics for sealing the affected components. Ensure the use of the correct type of sealers. Refer to **Sealers, Adhesives, and Lubricants**.

Test Description

The number below refers to the step number on the diagnostic table.

5: Use an approved method to clean the transmission to ensure the leak location is correctly identified. If using a powder method or dye method, ensure the products are compatible with the transmission fluid.

Transmission Fluid Leak Diagnosis

Step	Action	Yes	No
DEFINITION: Visible sign of the transmission fluid leaking from the transmission.			
1	Did you review the **Symptoms - Manual Transmission** and perform the necessary inspections?	Go to **Step 2**	Go to **Symptoms - Manual Transmission**
2	1. Inspect for the transmission fluid level higher than the recommended level. Refer to **Transmission Fluid Replacement**. 2. Adjust the transmission level if incorrect. Was the transmission fluid level too high?	Go to **Step 19**	Go to **Step 3**
3	Inspect the transmission vent for a blockage. Is the transmission vent blocked?	Go to **Step 4**	Go to **Step 5**
	Repair or replace the transmission vent. Refer		

4	to **Transmission Vent Tube Replacement**. Did you find and repair the condition?	Go to **Step 19**	Go to **Step 5**
5	Verify the location of the leak. 1. Clean the transmission assembly. 2. Operate the vehicle for 24 km (15 mi), or until normal operating temperatures are reached. 3. Visual inspect or use the powder method or dye and black light method to locate the leak. Is the leak occurring at the drain or fill plug?	Go to **Step 6**	Go to **Step 7**
6	Replace the drain or fill plug. Refer to **Transmission Fluid Replacement**. Did you find and repair the condition?	Go to **Step 19**	Go to Diagnostic Aids
7	Is the leak at the transmission output shaft seal?	Go to **Step 8**	Go to **Step 9**
8	Remove the output shaft seal and inspect for the following. Refer to **Extension Housing Disassemble** and **Extension Housing Assemble**. • Damaged or worn seal • Damaged seal bore • Improper installation • Cracks in the component • Propeller shaft yoke sealing surface is scratched, nicked, damaged, or worn • Loose or worn bearing causing excessive seal wear • Yoke flange nut loose Did you find and repair the condition?	Go to **Step 19**	Go to Diagnostic Aids
9	Is the leak at the front of the transmission?	Go to **Step 10**	Go to **Step 12**
	1. Inspect for the leak at the input shaft seal.		

10	2. Inspect for the following if the input shaft seal is leaking: • Damaged or worn seal • Damaged seal bore • Improper installation • Cracks in the component • Input shaft sealing surface is scratched, nicked, damaged or worn • Loose or worn bearing causing excessive seal wear 3. Replace the input shaft seal if leaking. Refer to the Adapter Plate section of **Transmission Case and Adapter Disassemble** and **Transmission Case and Adapter Assemble**. Did you find and repair the condition?	Go to **Step 19**	Go to **Step 11**
11	1. Inspect the case for cracks or porosity. 2. Replace the transmission front case half if it is faulty. Refer to **Transmission Disassemble (Corvette Z06)**. Did you find and repair the condition?	Go to **Step 19**	Go to Diagnostic Aids
12	Is the leak at the backup light switch?	Go to **Step 13**	Go to **Step 15**
13	1. Remove the backup light switch. Refer to **Backup Lamp Switch Replacement**. 2. Inspect for the following: • Cross threaded or damaged threads • Insufficient sealant • Leaking switch • Improper installation Did you find and repair the condition?	Go to **Step 19**	Go to **Step 1**
	1. Remove the shift shaft detent sleeve. Refer to **Transmission Disassemble (Corvette**		

14	**Z06)** and **Transmission Assemble (Z06)**. 2. Inspect for the following: • Cross threaded or damaged threads • Insufficient sealant • Cracked sleeve or case • Improper installation Did you find and repair the condition?	Go to **Step 19**	Go to **Step 1**
15	Is the leak at the sealing flanges of the transmission case?	Go to **Step 16**	Go to **Step 17**
16	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 3. Inspect the sealing surfaces. Refer to **Transmission Case and Adapter Cleaning and Inspection** and **Extension Housing Cleaning and Inspection**. Did you find and repair the condition?	Go to **Step 19**	Go to **Step 17**
17	Is the leak coming from a crack or porosity in the transmission case ?	Go to **Step 18**	Go to Diagnostic Aids
18	1. Remove the transmission. Refer to **Transmission Replacement**. 2. Disassemble the transmission. Refer to **Transmission Disassemble (Corvette Z06)**. 3. Replace the faulty case. Refer to **Transmission Assemble (Z06)**. Did you find and repair the condition?	Go to **Step 19**	Go to Diagnostic Aids
19	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to **Step 1**

REPAIR INSTRUCTIONS

TRANSMISSION FLUID LEVEL INSPECTION

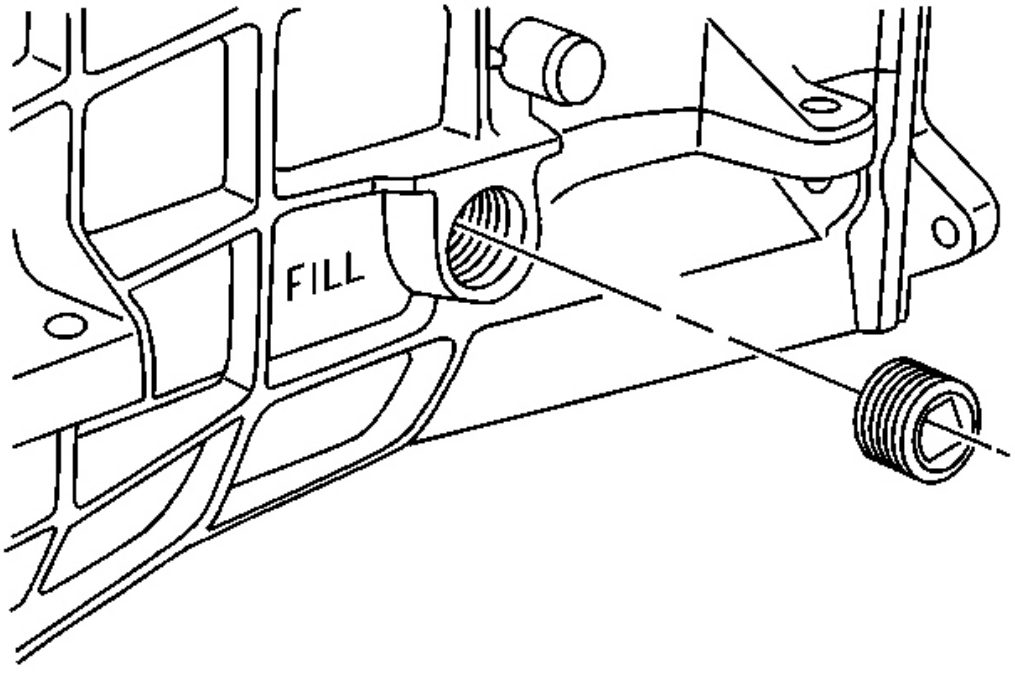


Fig. 23: Identifying Transmission Fill Plug
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle; ensure that the vehicle is level. Refer to **Lifting and Jacking the Vehicle** .
2. Clean any dirt from around the fill plug hole.
3. Remove the transmission fluid fill plug hole.

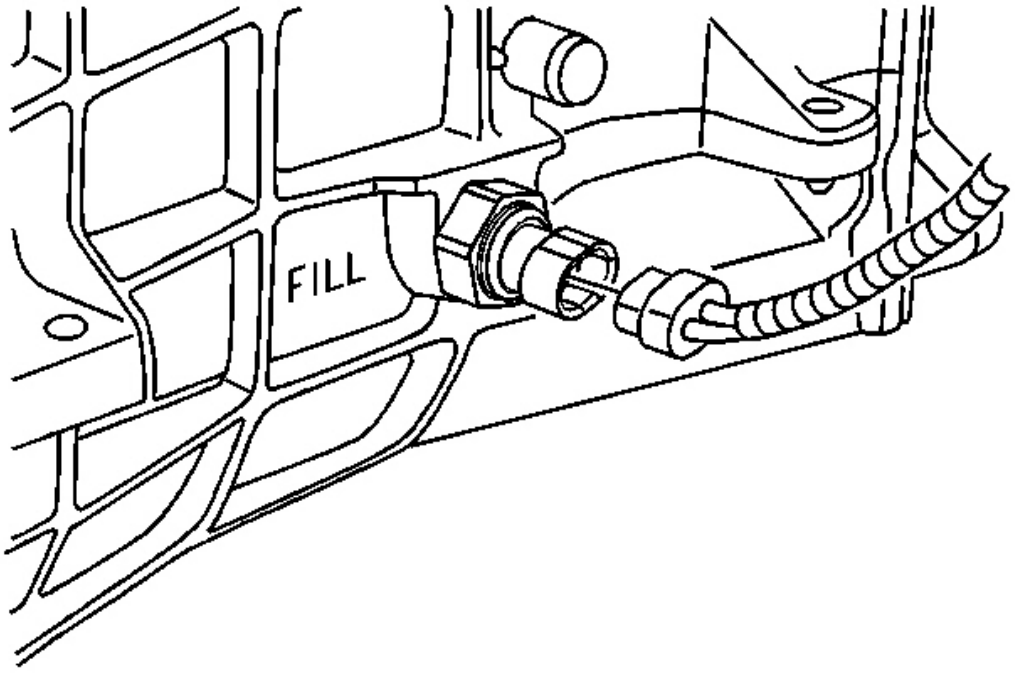


Fig. 24: Transmission Fluid Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

4. If equipped, disconnect the transmission fluid temperature (TFT) sensor electrical connector.
5. Clean any dirt from around the TFT sensor.

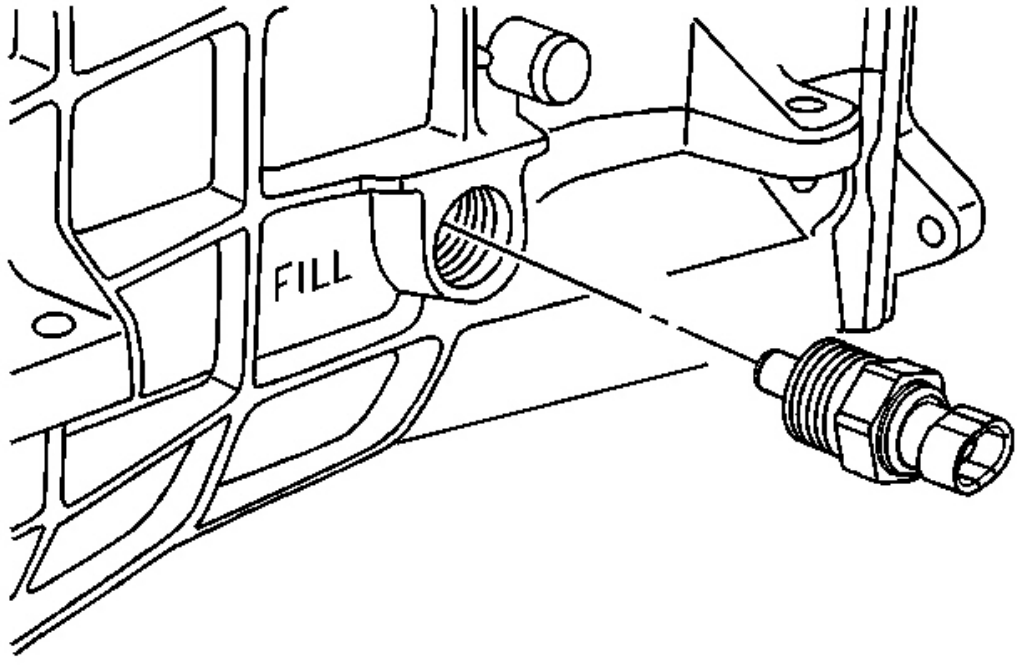


Fig. 25: Inspecting Transmission Fluid Level Is Even Bottom Of Fill Plug Hole
Courtesy of GENERAL MOTORS CORP.

6. If equipped, remove the TFT sensor from the transmission.
7. Inspect the transmission fluid level. Ensure that the fluid level is even with the bottom of the fill plug hole.
8. Add Dexron® - VI transmission fluid, if necessary.

NOTE: Refer to Component Fastener Tightening Notice .

9. If equipped, install the TFT sensor to the transmission.

Tighten: Tighten the TFT sensor to 27 N.m (20 lb ft).

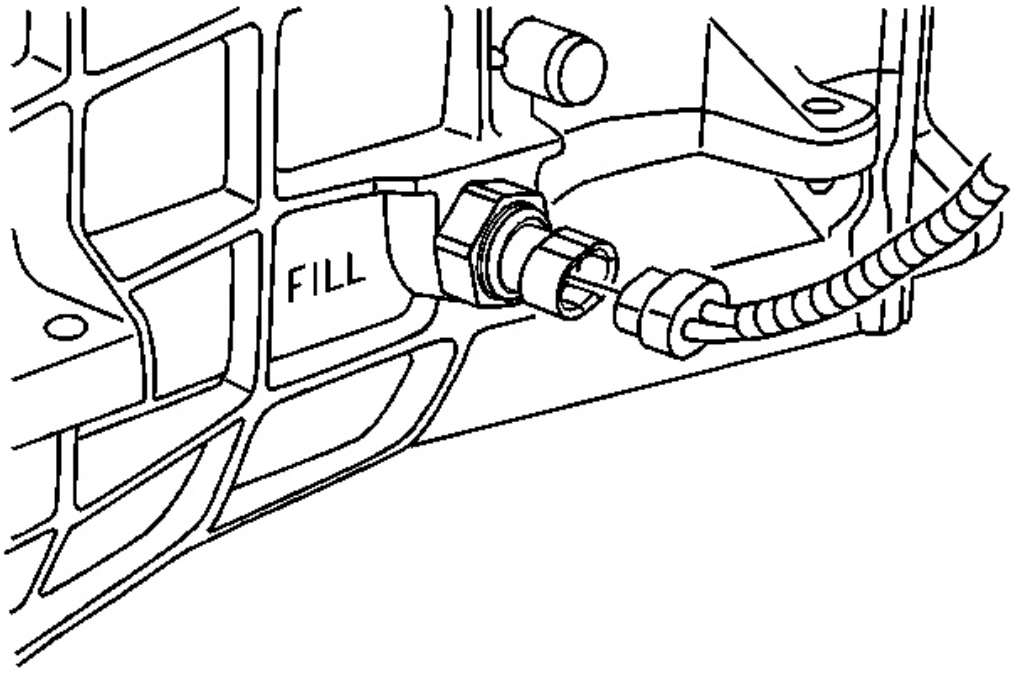


Fig. 26: Transmission Fluid Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

10. If equipped, connect the TFT sensor electrical connector.

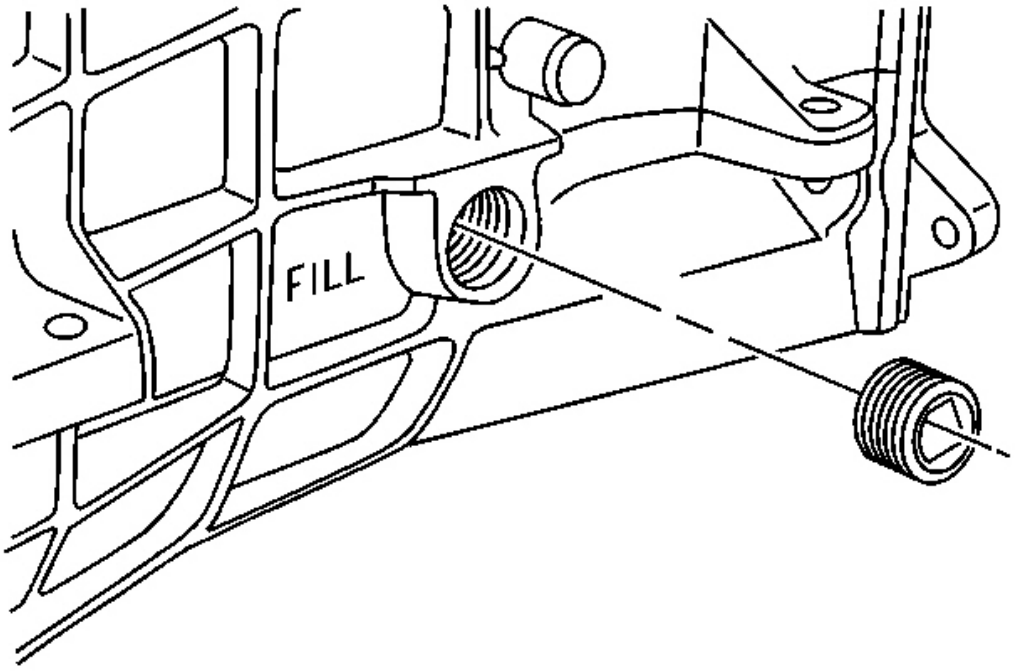


Fig. 27: Identifying Transmission Fill Plug
Courtesy of GENERAL MOTORS CORP.

11. Install the transmission fluid fill plug hole.

    Tighten: Tighten the transmission fluid fill plug hole to 27 N.m (20 lb ft).

12. Lower the vehicle.

SHIFT CONTROL ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the shift control knob. Refer to **Transmission Control Lever Knob Replacement**.

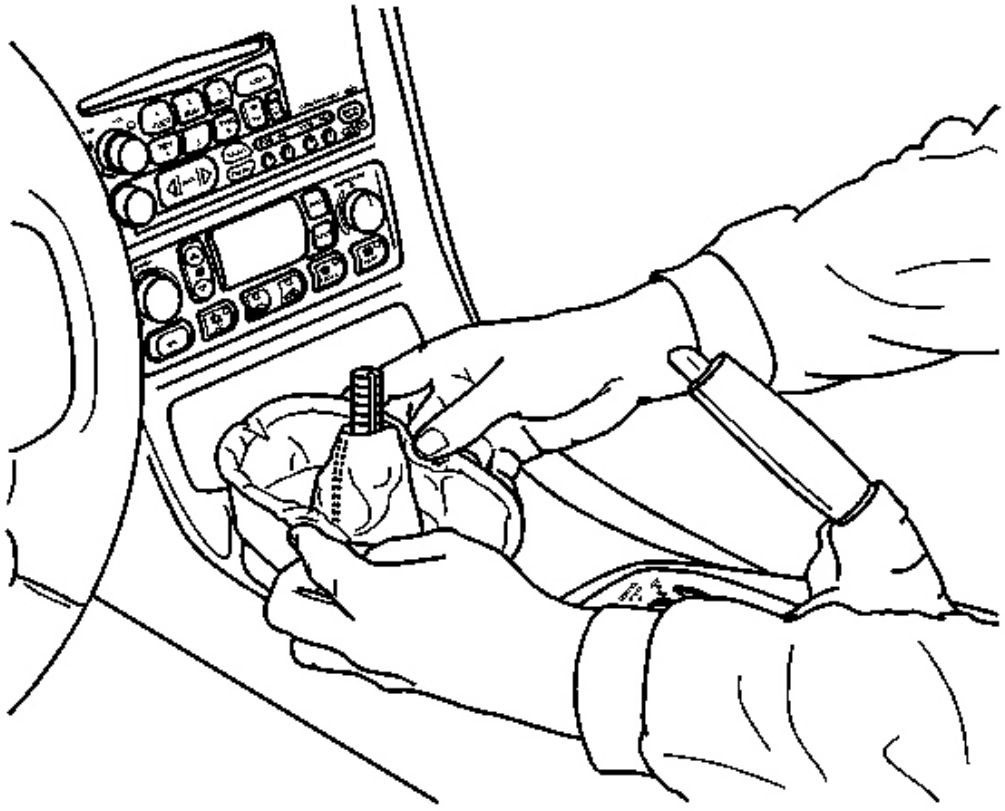


Fig. 28: Sides Of Shift Control Boot To I/P Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

2. Grasp the sides of the shift control boot and apply light pressure in toward the shift control lever to begin to release the shift boot retaining tabs from the instrument panel (I/P) accessory trim plate.
3. Using light pressure, continue to release the remaining boot retaining tabs.

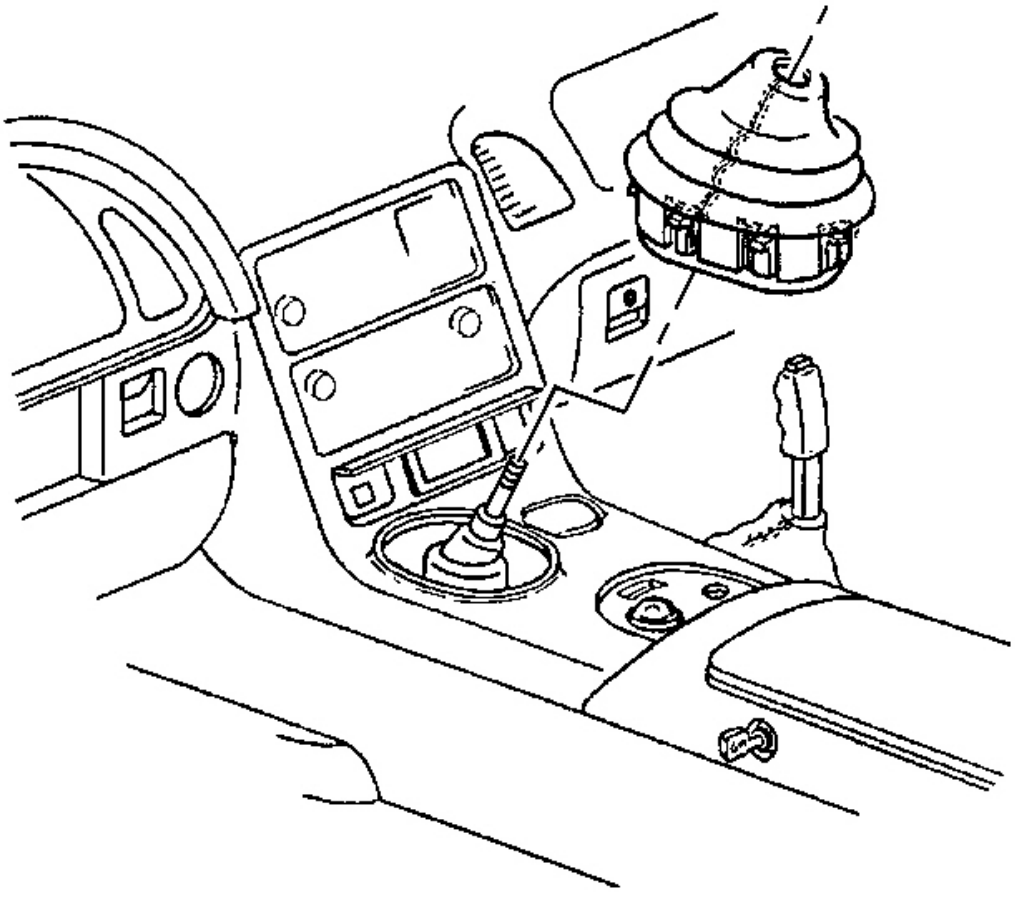


Fig. 29: Shift Control Boot To Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

4. Lift the boot away from the trim plate and remove the boot.
5. Remove the I/P accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .

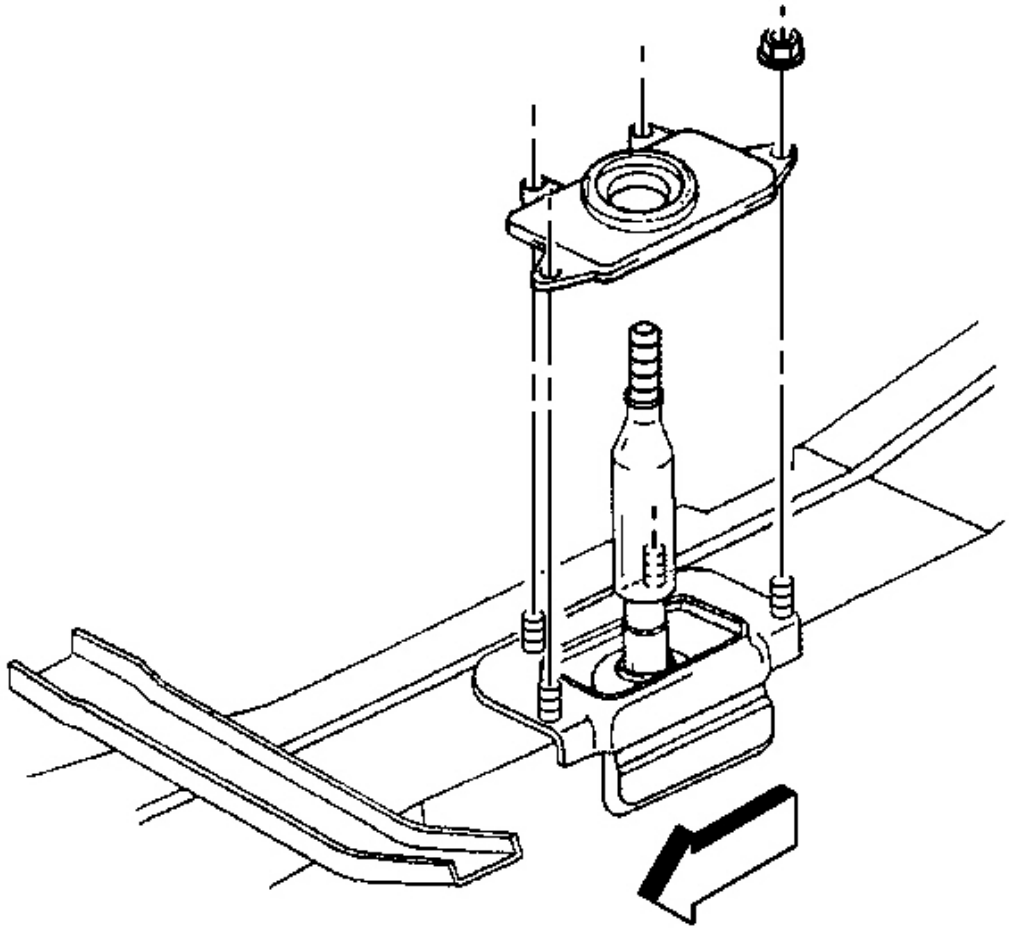


Fig. 30: Left I/P Lower Insulator Panel
Courtesy of GENERAL MOTORS CORP.

6. Remove the acoustic boot for the shiftier.
7. Remove the shift control closeout boot retaining nuts.
8. Remove the shift control closeout boot.

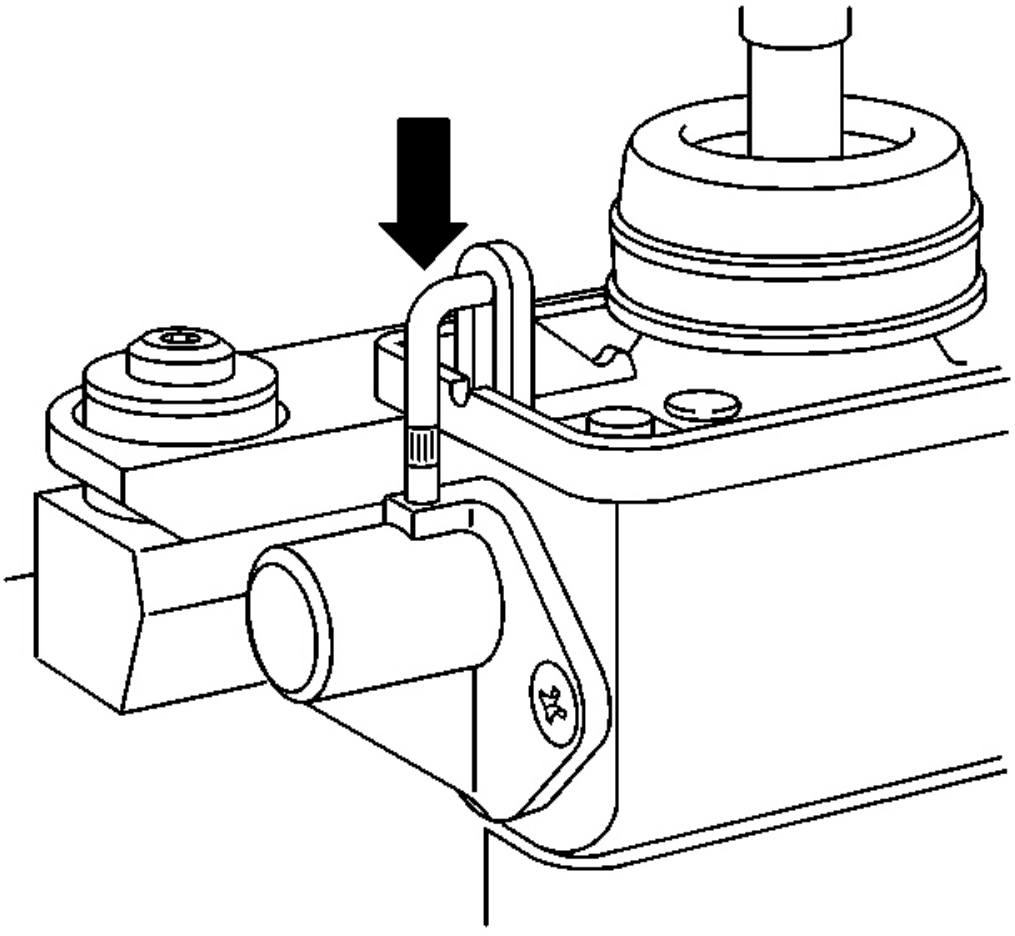


Fig. 31: Shift Control Neutral Lock Pin
Courtesy of GENERAL MOTORS CORP.

9. Place the shiftier into NEUTRAL.
10. Press down to engage the shift control neutral lock pin.

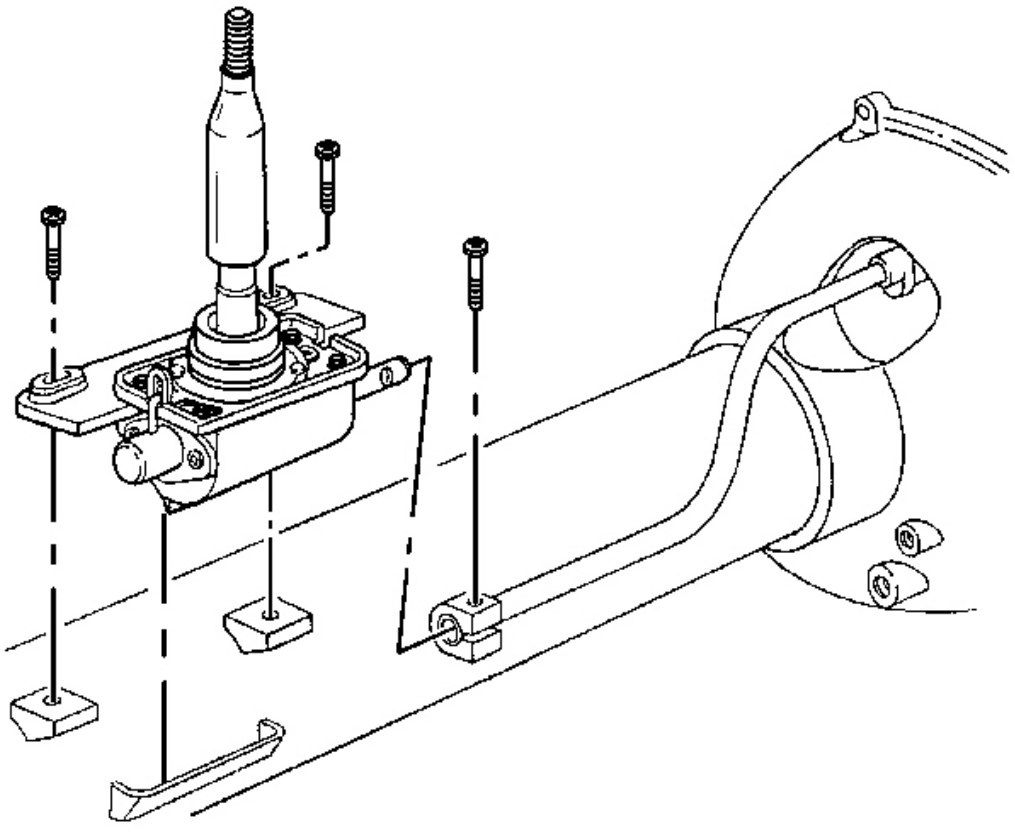


Fig. 32: Transmission Shift Rod, Clamp & Bolt
Courtesy of GENERAL MOTORS CORP.

11. Remove the transmission shift rod clamp bolt.
12. Remove the shift control mounting bolts.
13. Raise the shift control to release the locator from the shiftier bracket on the side of the driveline support assembly.
14. Release the shift control from the transmission shift rod clamp and remove the shift control assembly.

Installation Procedure

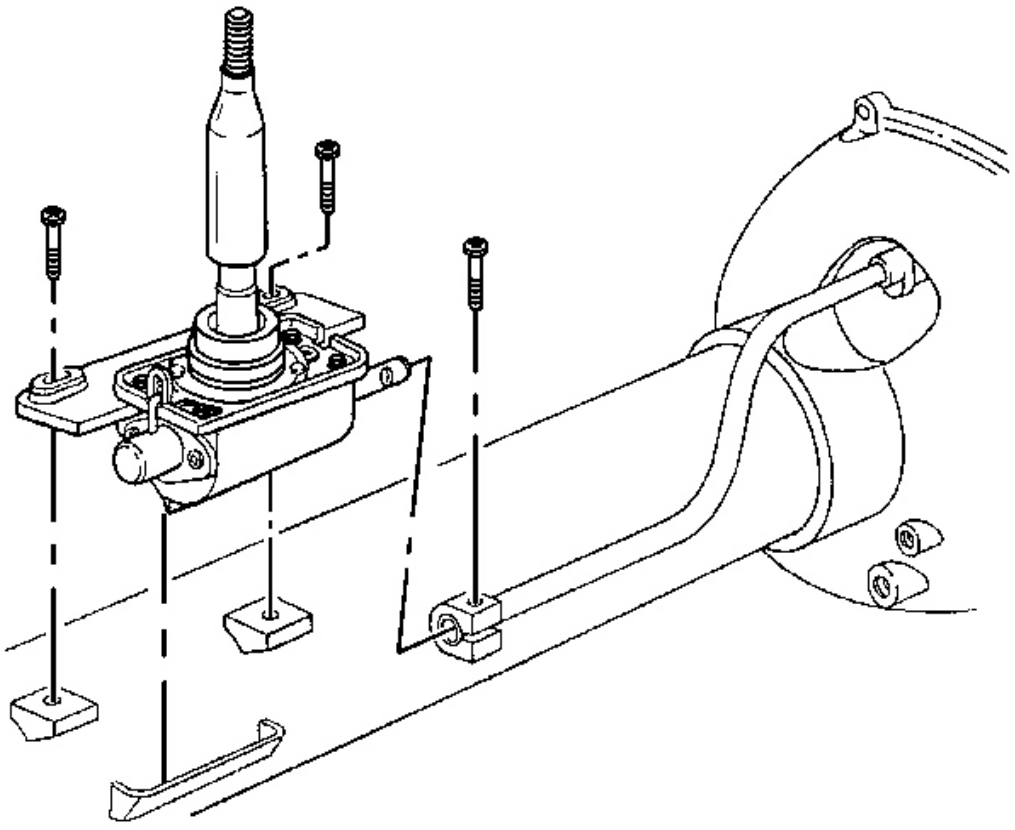


Fig. 33: Transmission Shift Rod, Clamp & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install the shift control assembly to the transmission shift rod clamp.
2. Lower the shiftier into position and insert the locator into the shiftier bracket on the side of the driveline support assembly.

NOTE: Refer to Fastener Notice .

3. Install the shift control mounting bolts.

   Tighten: Tighten the shift control mounting bolts to 30 N.m (22 lb ft).

4. Install the transmission shift rod clamp bolt.

Tighten: Tighten the transmission shift rod clamp bolt to 30 N.m (22 lb ft).

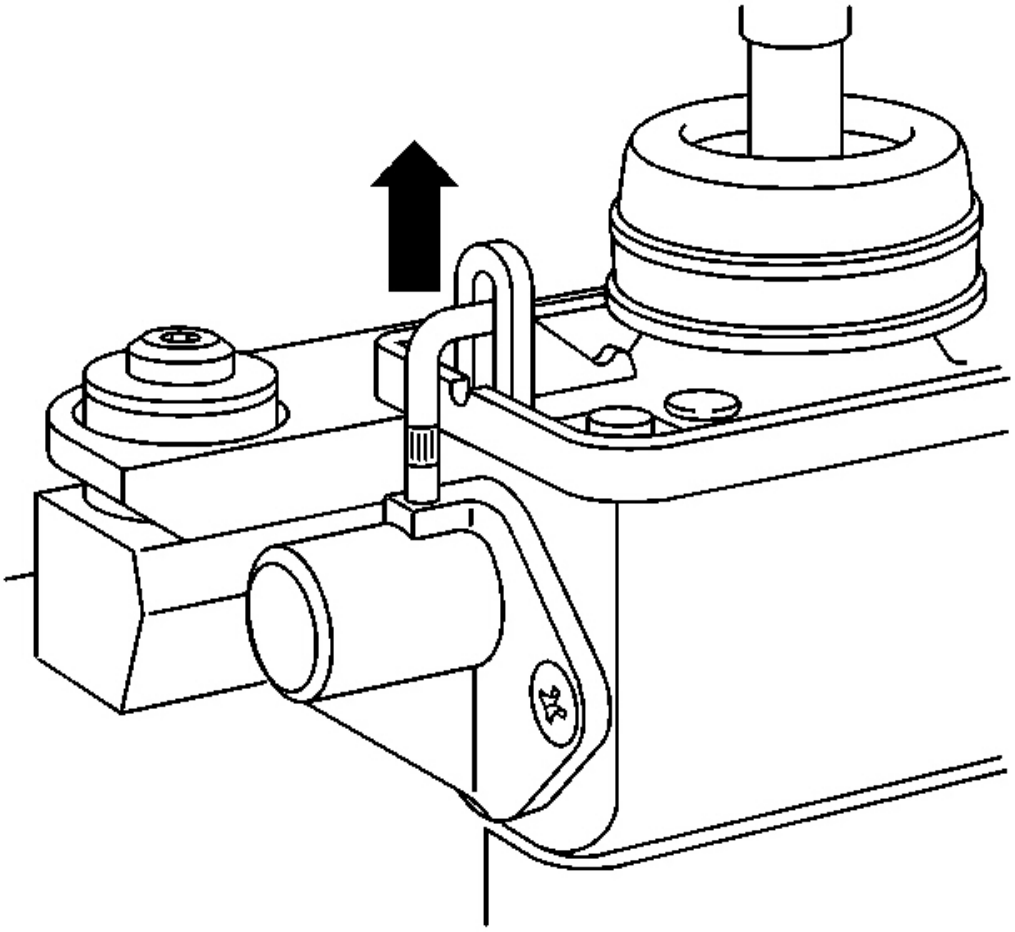


Fig. 34: Releasing The Shift Control Neutral Lock Pin
Courtesy of GENERAL MOTORS CORP.

5. Lift to release the shift control neutral lock pin.

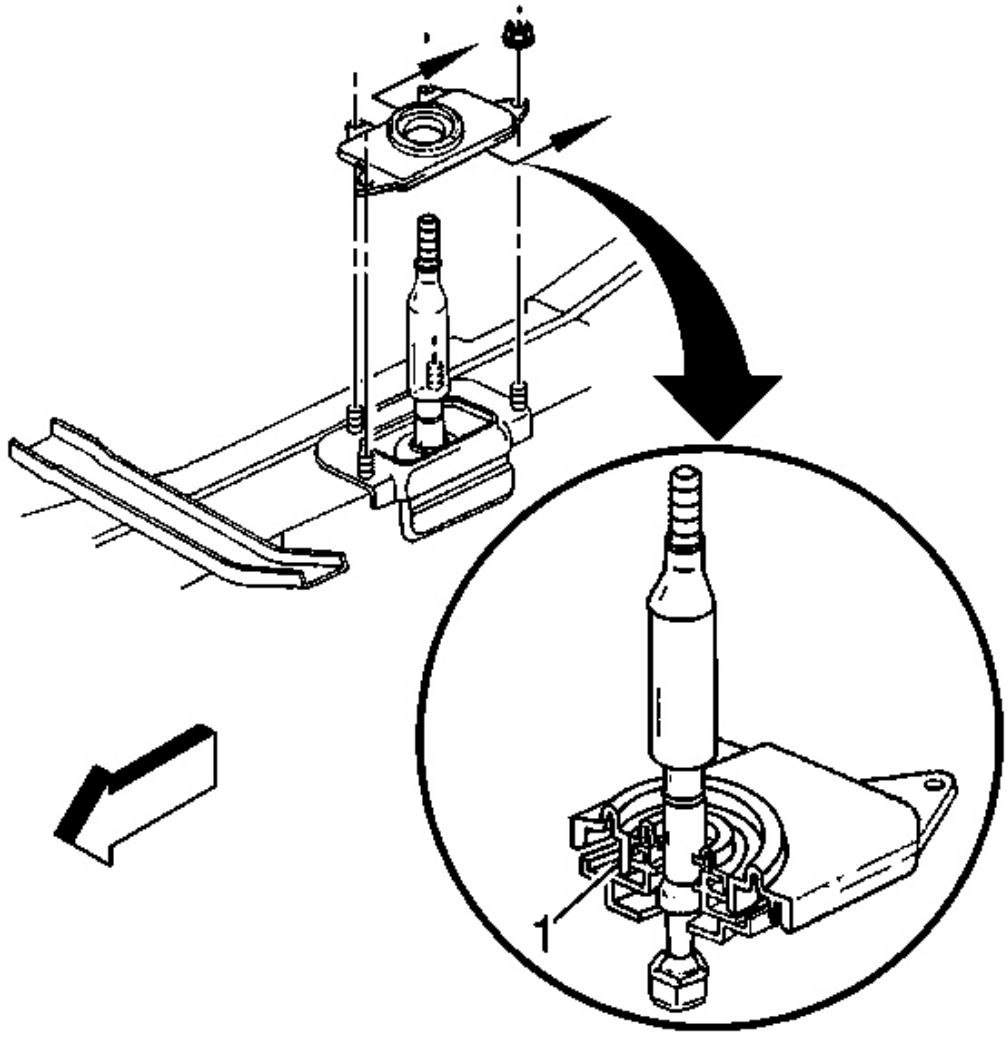


Fig. 35: Shift Control Closeout Boot & Nuts
Courtesy of GENERAL MOTORS CORP.

6. Install the shift control closeout boot.

   Check that the closeout boot fully seats to the shift control lever seal and the base of the shift control assembly (1).

7. Install the shift control closeout boot retaining nuts.

Tighten: Tighten the shift control closeout boot retaining nuts to 12 N.m (106 lb in).

8. Install the acoustic boot.

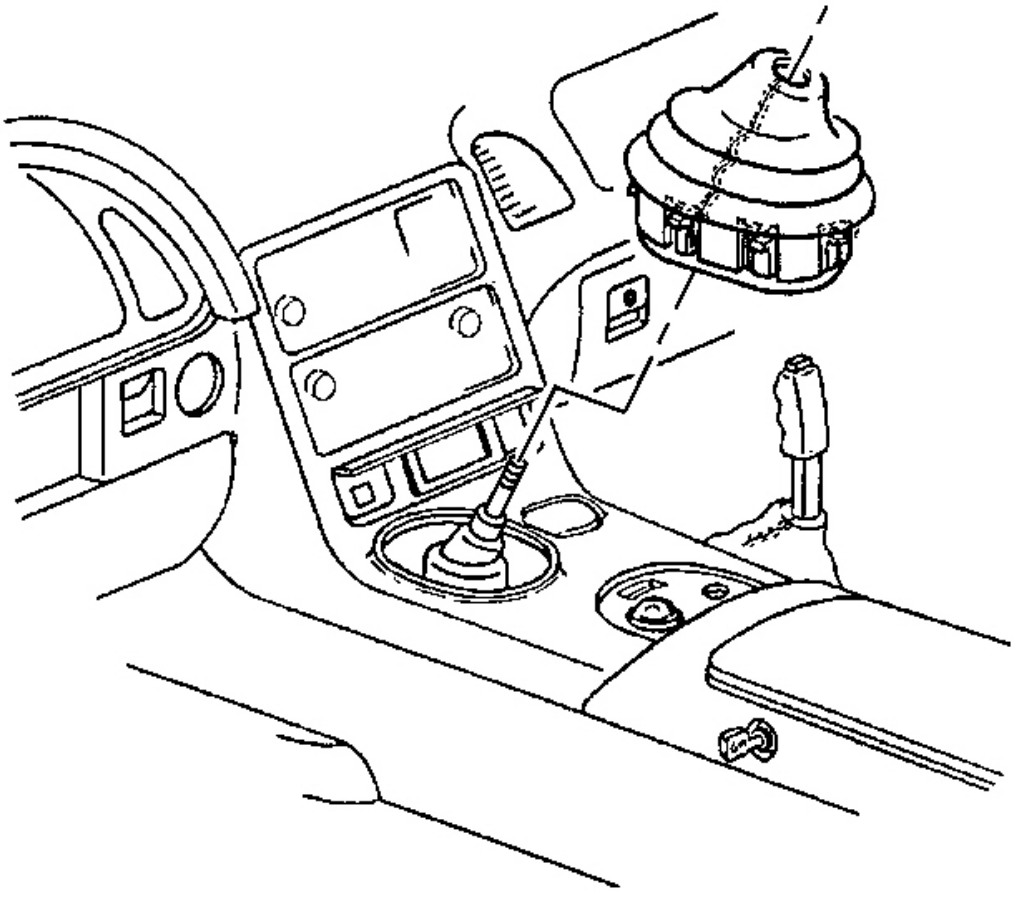


Fig. 36: Shift Control Boot To Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

9. Install the I/P accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .
10. Install the shift control boot over the shift control lever.

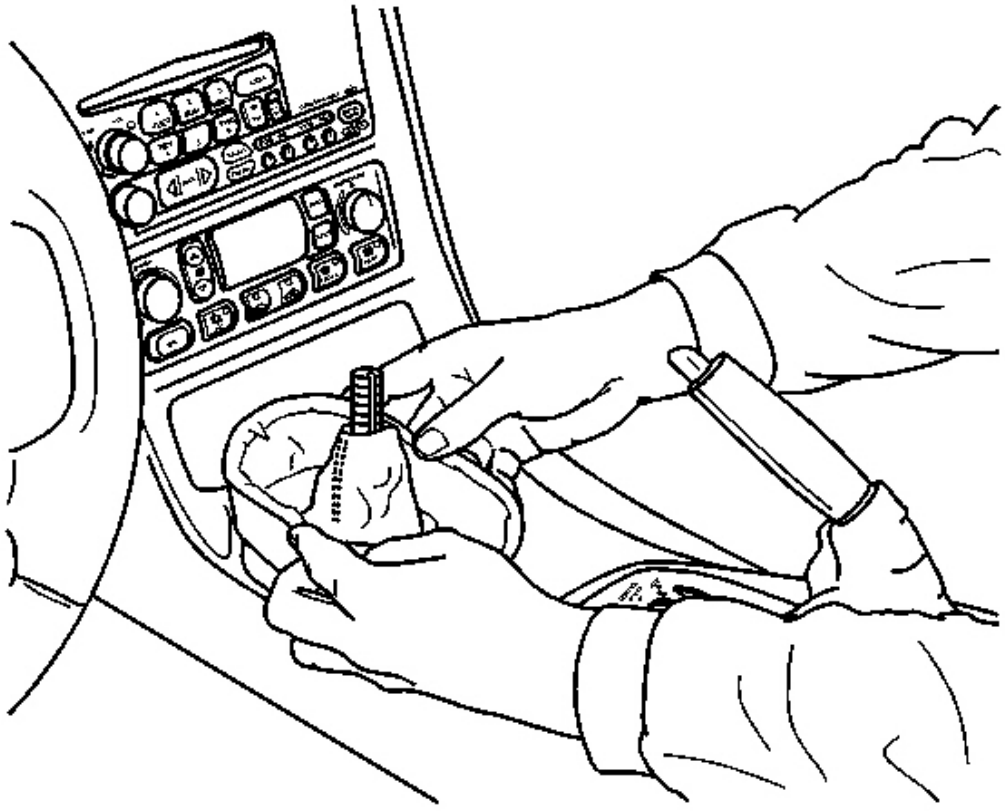


Fig. 37: Shift Control Boot To I/P Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

11. Align the shift control boot to the I/P accessory trim plate opening, then press to lock the boot retaining tabs.
12. Adjust the shape of the boot for appearance, if necessary.
13. Install the shift control knob. Refer to **Transmission Control Lever Knob Replacement**.
14. Install the console. Refer to **Console Replacement** .

TRANSMISSION CONTROL BOOT REPLACEMENT

Removal Procedure

1. Remove the shift control knob. Refer to **Transmission Control Lever Knob**

Replacement.

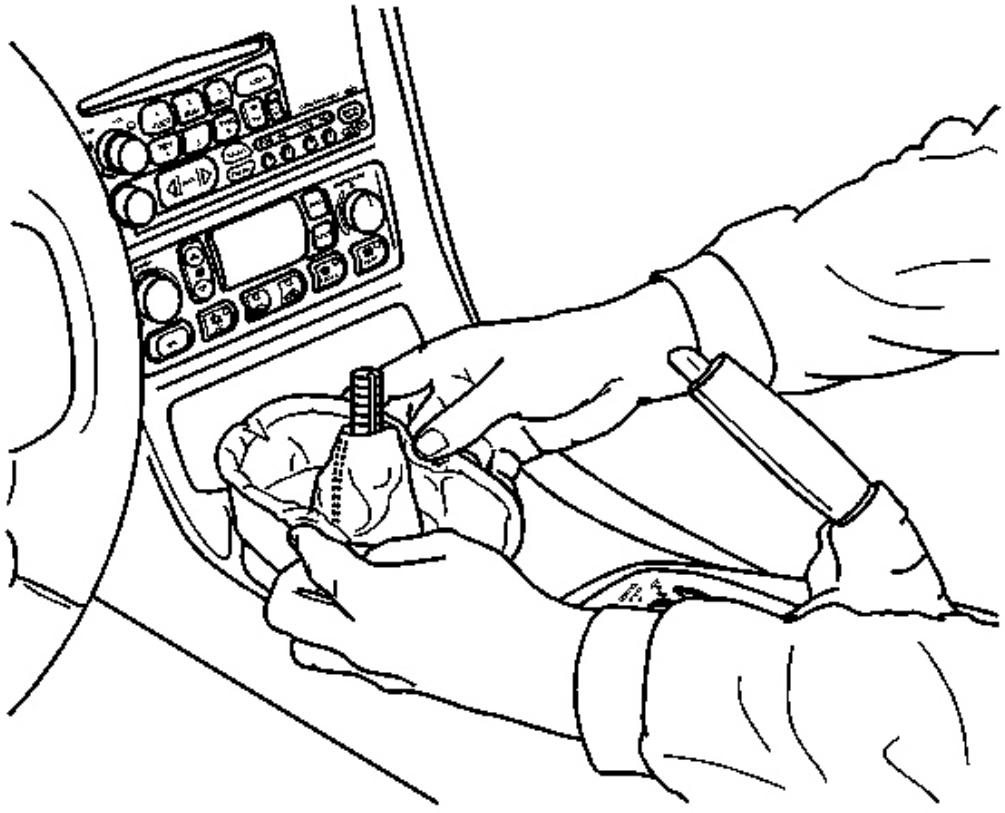


Fig. 38: Sides Of Shift Control Boot To I/P Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

2. Grasp the sides of the shift control boot and apply light pressure in toward the shift control lever to begin to release the shift boot retaining tabs from the instrument panel (I/P) accessory trim plate.
3. Using light pressure, continue to release the remaining boot retaining tabs.

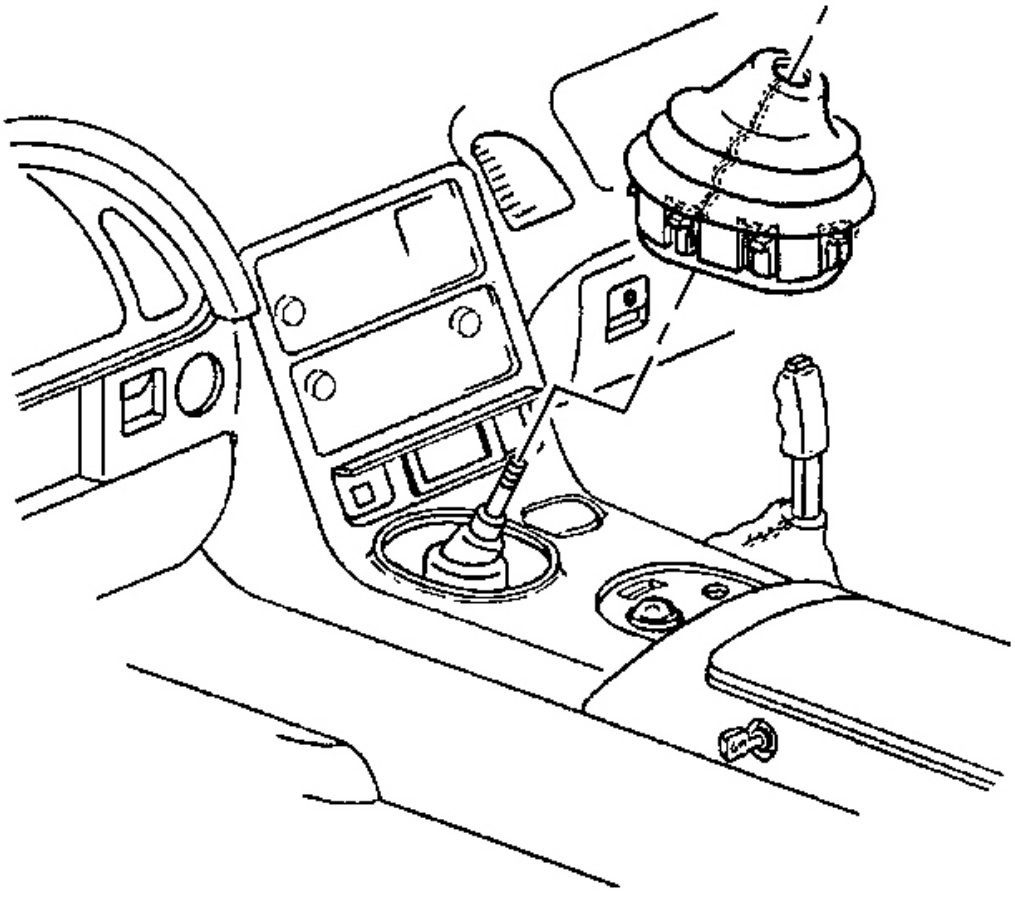


Fig. 39: Shift Control Boot To Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

4. Lift the boot away from the trim plate and remove the boot.

Installation Procedure

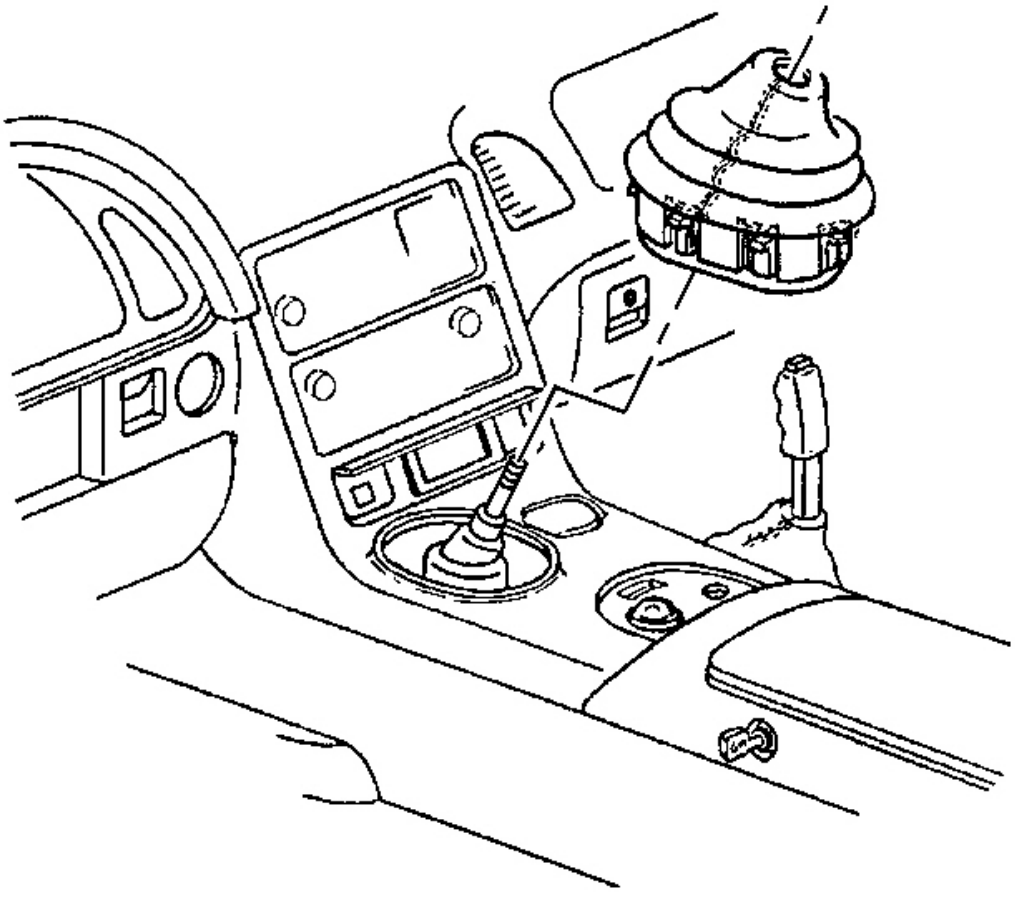


Fig. 40: Shift Control Boot To Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

1. Install the shift control boot over the shift control lever.

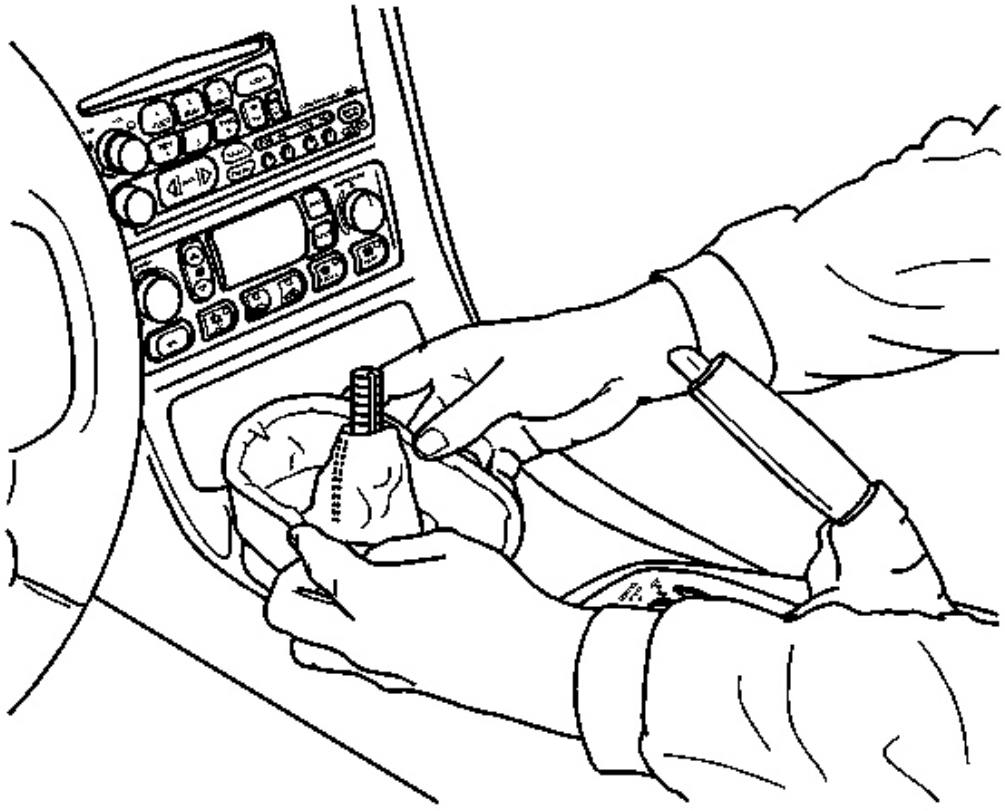


Fig. 41: Shift Control Boot To I/P Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

2. Align the shift control boot to the I/P accessory trim plate opening, then press to lock the boot retaining tabs.
3. Adjust the shape of the boot for appearance, if necessary.
4. Install the shift control knob. Refer to **Transmission Control Lever Knob Replacement**.

SHIFT CONTROL SHIFT CLOSEOUT BOOT REPLACEMENT

Removal Procedure

1. Remove the shift control knob. Refer to **Transmission Control Lever Knob Replacement**.

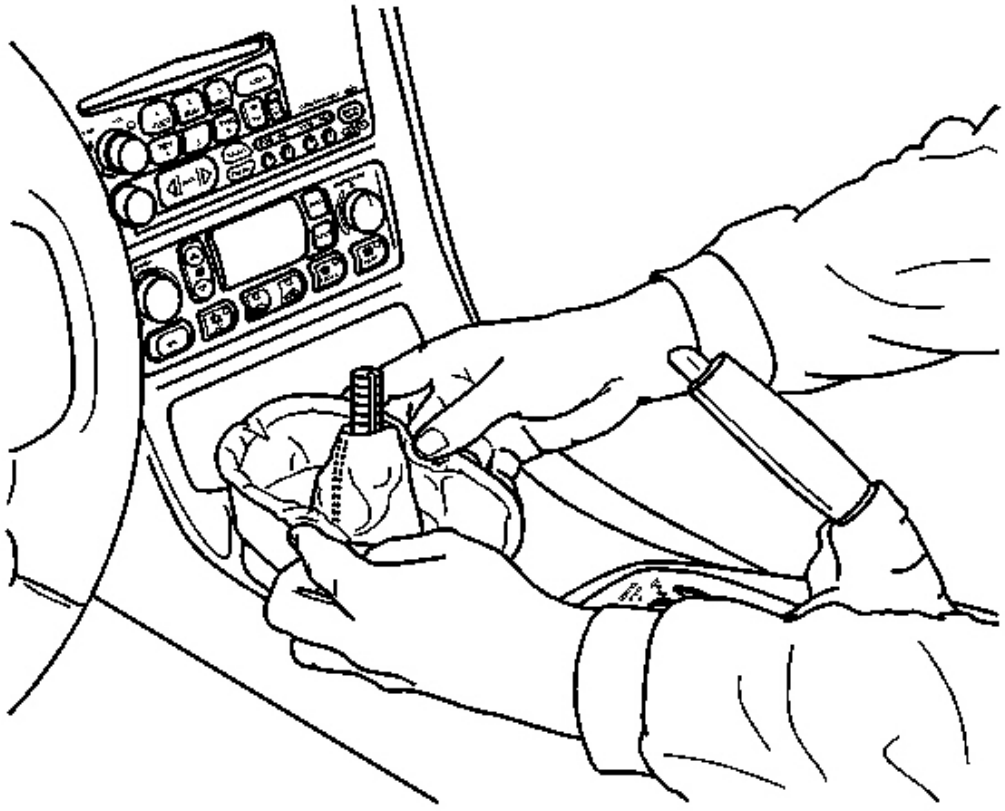


Fig. 42: Sides Of Shift Control Boot To I/P Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

2. Grasp the sides of the shift control boot and apply light pressure in toward the shift control lever to begin to release the shift boot retaining tabs from the instrument panel (I/P) accessory trim plate.
3. Using light pressure, continue to release the remaining boot retaining tabs.

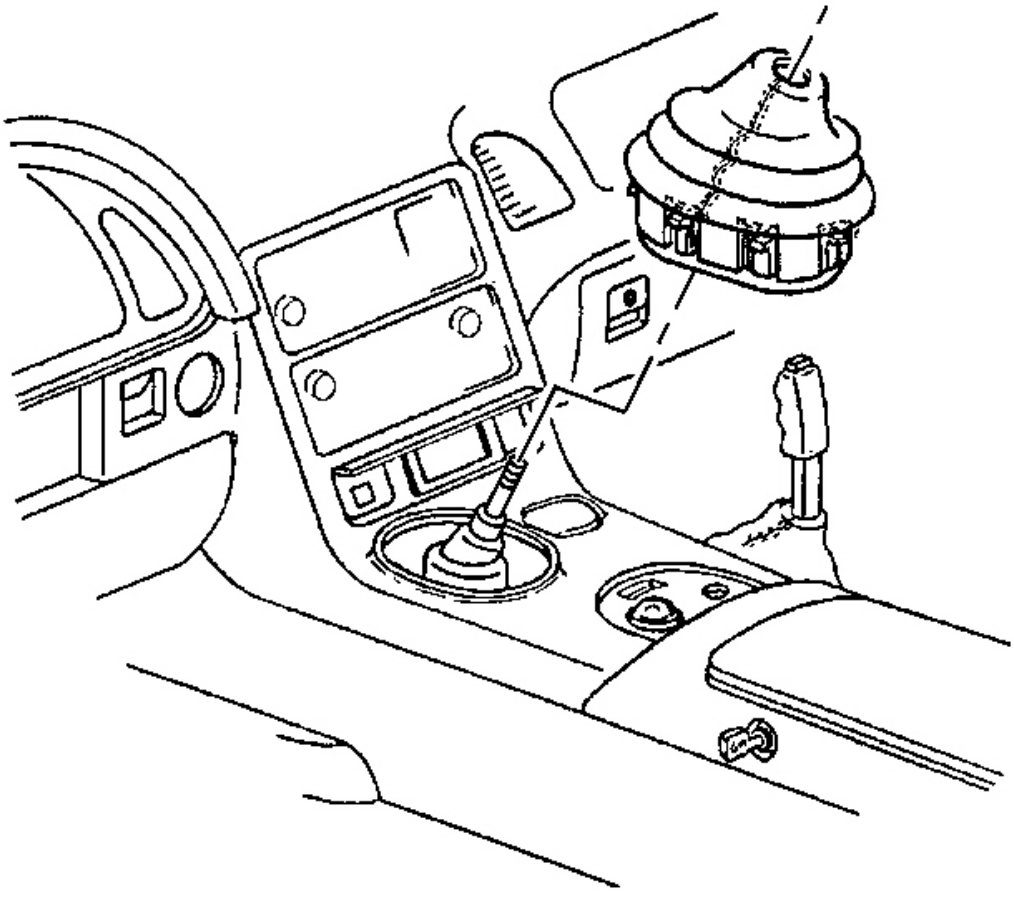


Fig. 43: Shift Control Boot To Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

4. Lift the boot away from the trim plate and remove the boot.
5. Remove the I/P accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .

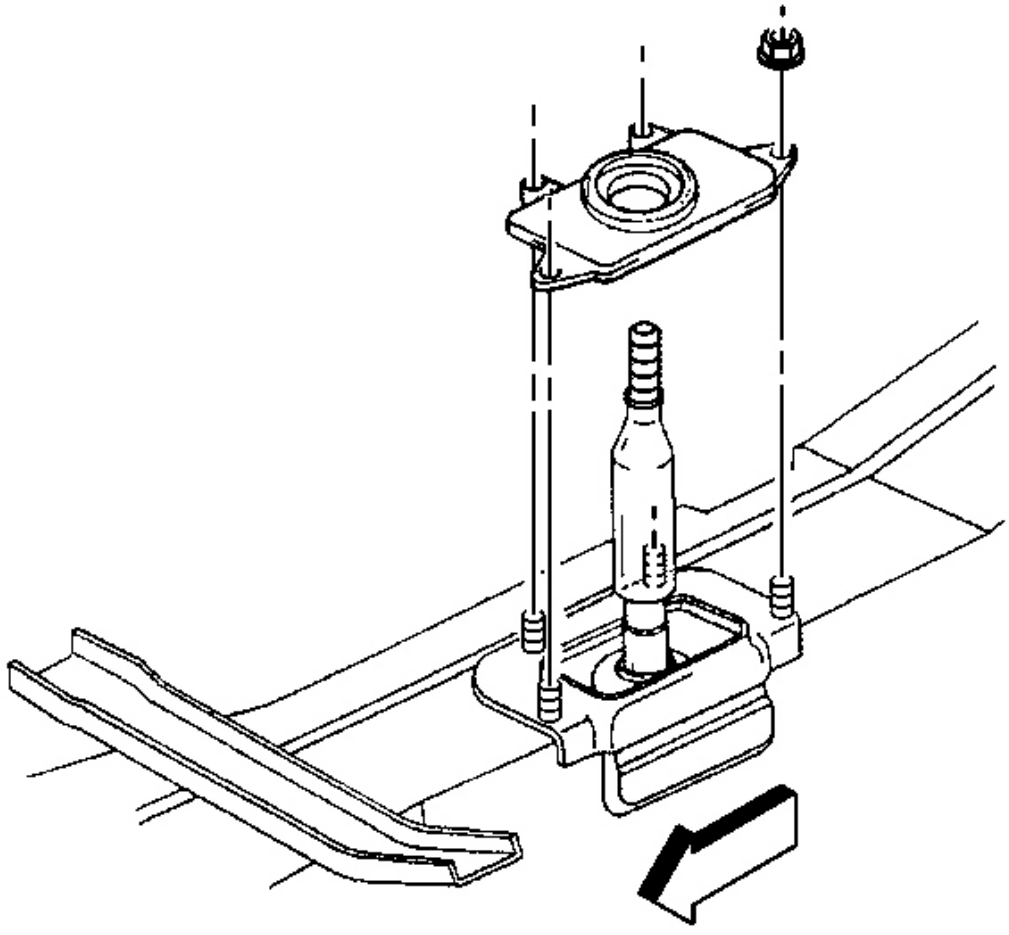


Fig. 44: Left I/P Lower Insulator Panel
Courtesy of GENERAL MOTORS CORP.

6. Remove the shift control closeout boot retaining nuts.
7. Remove the shift control closeout boot.

Installation Procedure

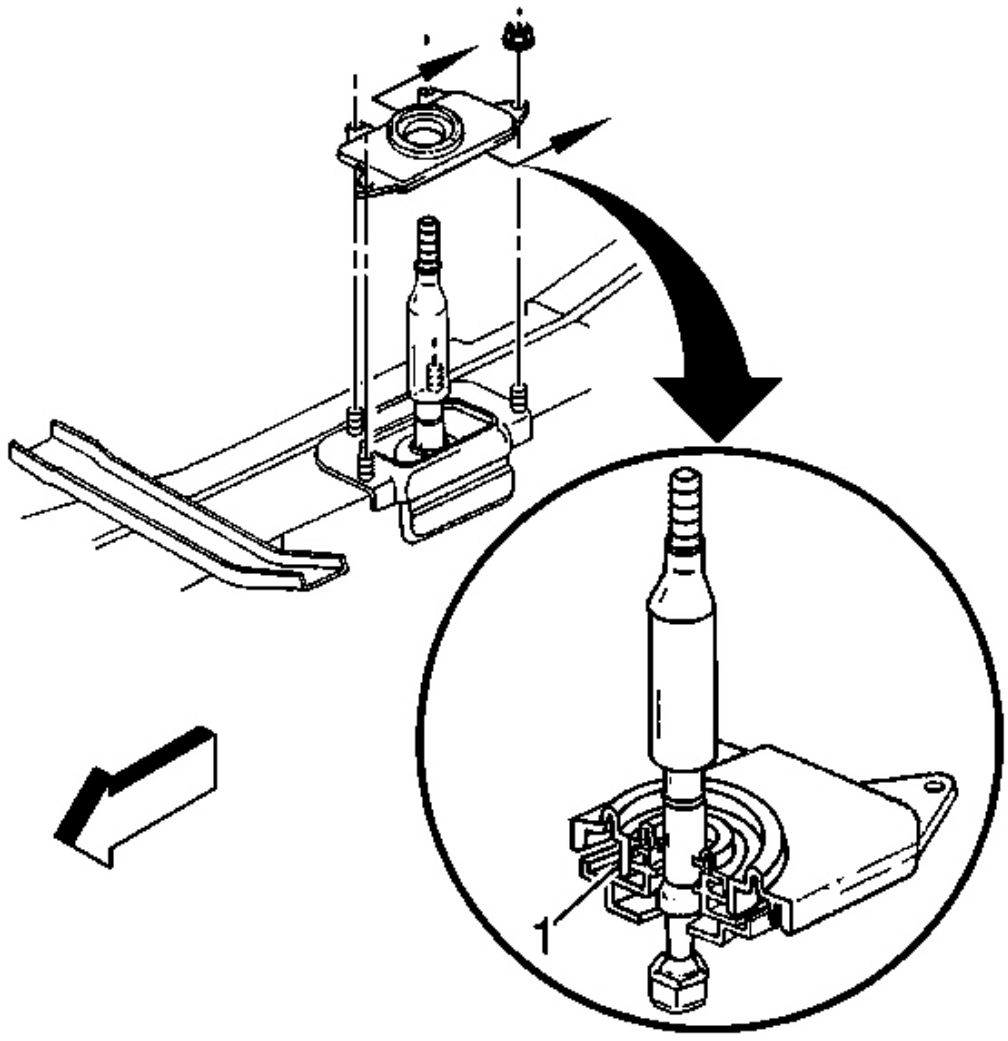


Fig. 45: Shift Control Closeout Boot & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the shift control closeout boot.

   Check that the closeout boot fully seats to the shift control lever seal and the base of the shift control assembly (1).

   NOTE: Refer to Fastener Notice .

2. Install the shift control closeout boot retaining nuts.

   Tighten: Tighten the shift control closeout boot retaining nuts to 12 N.m (106 lb in).

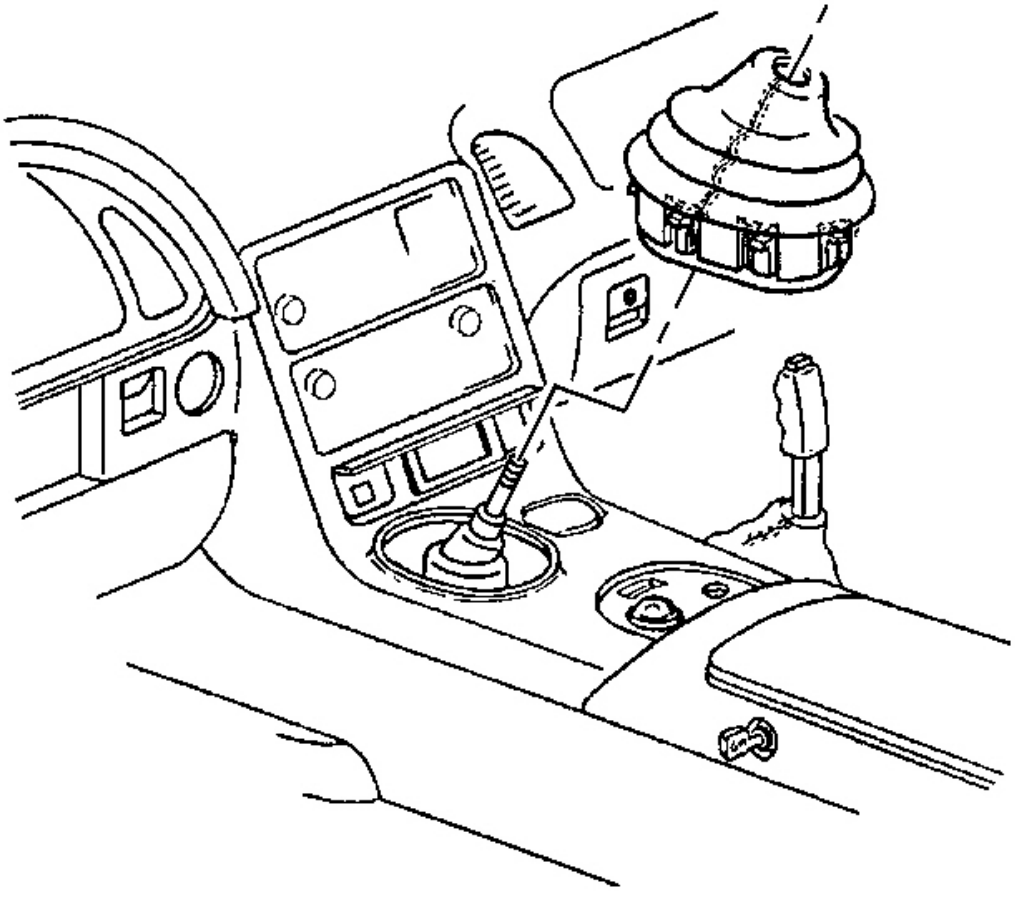


Fig. 46: Shift Control Boot To Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

3. Install the I/P accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .
4. Install the shift control boot over the shift control lever.

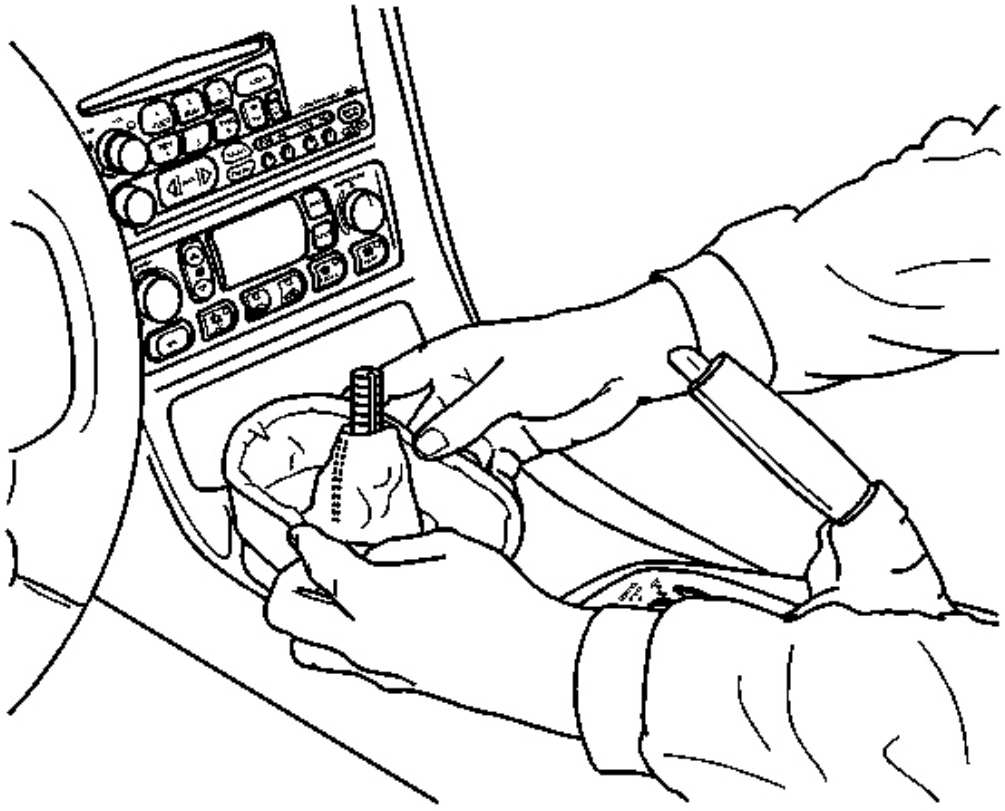


Fig. 47: Shift Control Boot To I/P Accessory Trim Plate
Courtesy of GENERAL MOTORS CORP.

5. Align the shift control boot to the I/P accessory trim plate opening, then press to lock the boot retaining tabs.
6. Adjust the shape of the boot for appearance, if necessary.
7. Install the shift control knob. Refer to **Transmission Control Lever Knob Replacement**.
8. Install the console. Refer to **Console Replacement** .

TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

Removal Procedure

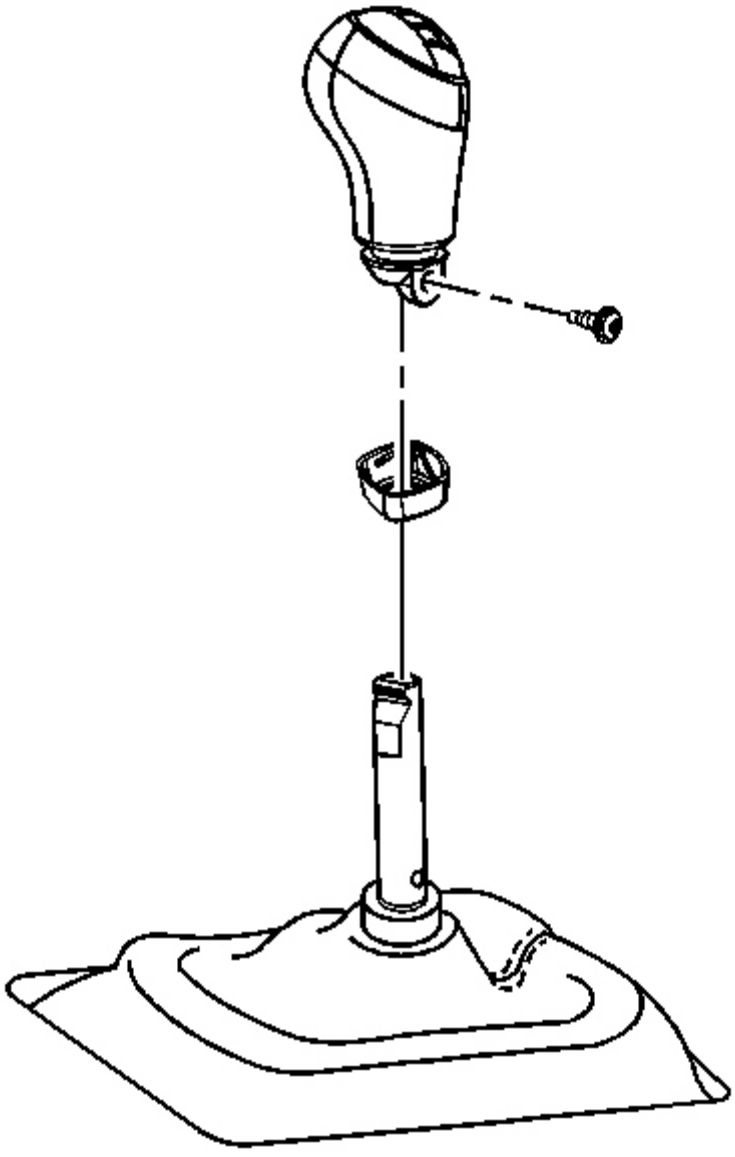


Fig. 48: Shift Control Knob, Retaining Screw & Trim Ring
Courtesy of GENERAL MOTORS CORP.

1. Carefully remove the shift control knob trim ring.
2. Remove the shift control knob retaining screw.

3. Remove the shift control knob.

Installation Procedure

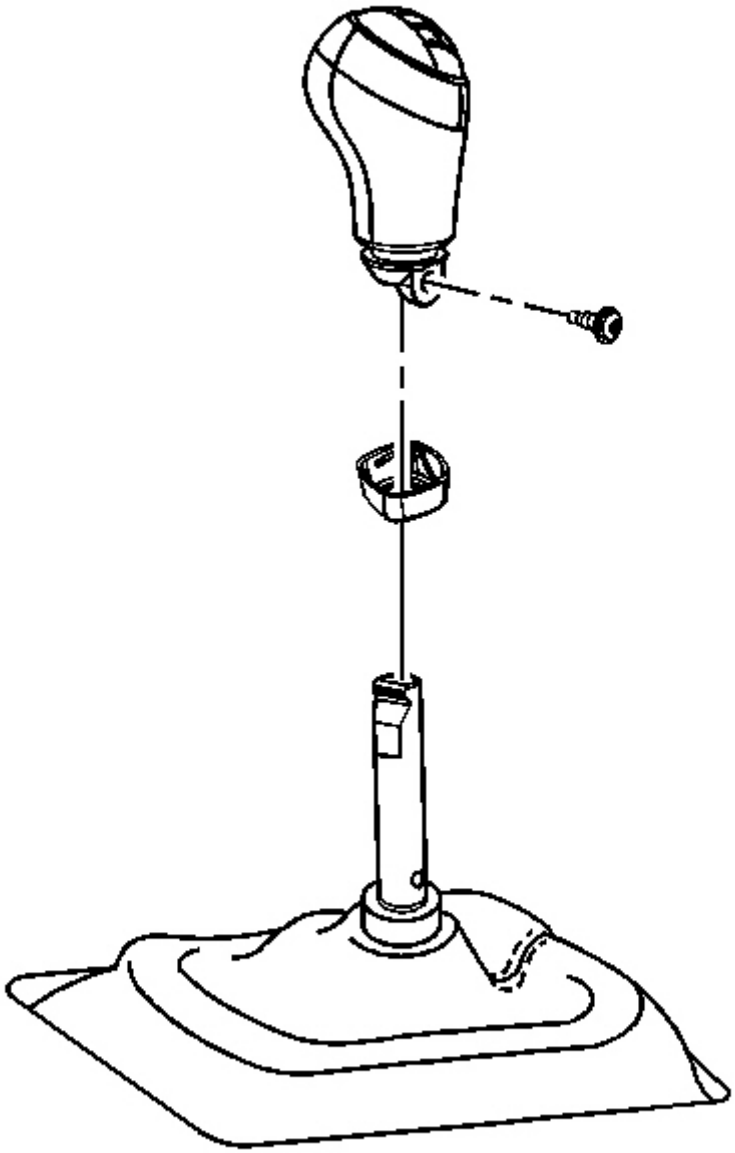


Fig. 49: Shift Control Knob, Retaining Screw & Trim Ring
Courtesy of GENERAL MOTORS CORP.

1. Install the shift control knob onto the shift control lever.

NOTE: Refer to Fastener Notice .

2. Install the shift control knob retainer screw.

Tighten: Tighten the screw to 2 N.m (18 lb in).

3. Install the shift control knob trim ring.

SHIFT ROD REPLACEMENT

Removal Procedure

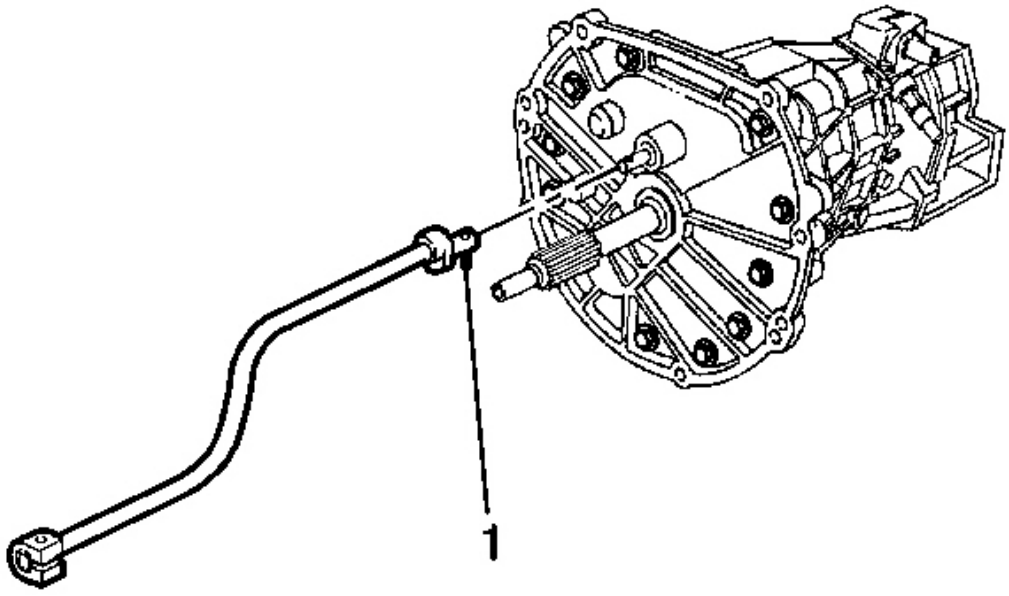


Fig. 50: Roll Pin, Transmission Shift Rod & Transmission Shift Shaft
Courtesy of GENERAL MOTORS CORP.

1. Remove the shift control assembly. Refer to **Shift Control Assembly Replacement**.
2. Remove the driveline support assembly, the transmission and the differential from the vehicle, then separate the transmission from the driveline support assembly. Refer to

Driveline Support Assembly Replacement in Driveline/Axle.

3. Slide the transmission shift rod toward the transmission until the transmission shift shaft seats in the rear-most detent position.

   (Placing the shift rod close to the transmission housing provides additional support for the transmission shift shaft.)

4. Using a drift or punch, remove the roll pin (1) retaining the transmission shift rod to the transmission shift shaft.
5. Remove the transmission shift rod from the transmission shift shaft.

Installation Procedure

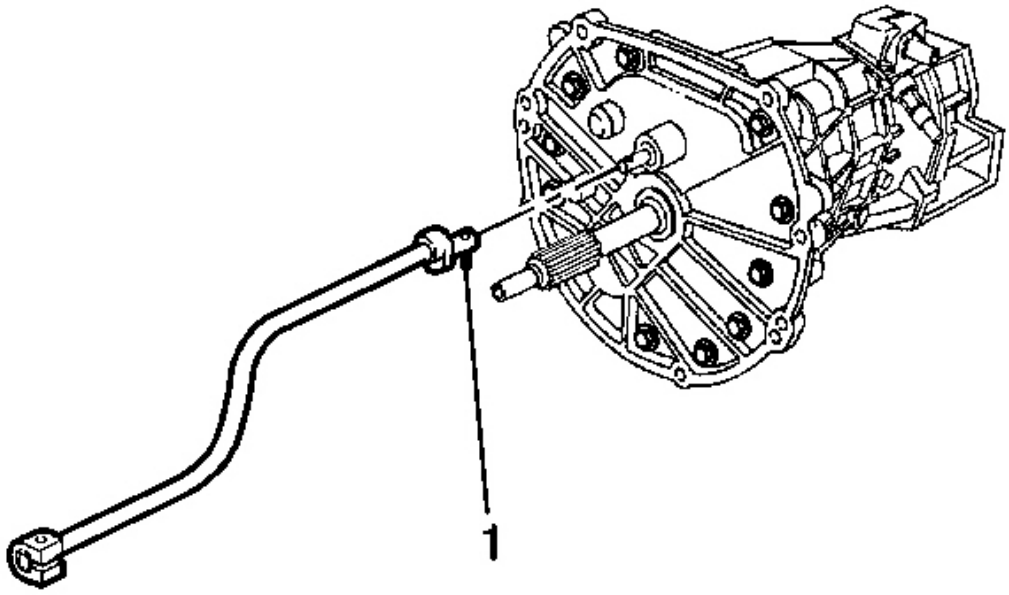


Fig. 51: Roll Pin, Transmission Shift Rod & Transmission Shift Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the transmission shift rod to the transmission shift shaft.
2. Using a drift or punch, install the roll pin (1) to retain the transmission shift rod to the shift shaft.
3. Pull the transmission shift rod away from the transmission to the middle detent position

(NEUTRAL).

4. Install the transmission to the driveline support assembly, then install the driveline support assembly, transmission and differential to the vehicle. Refer to **Driveline Support Assembly Replacement** in Driveline/Axle.
5. Install the shift control assembly. Refer to **Shift Control Assembly Replacement**.

SHIFT LINKAGE ADJUSTMENT

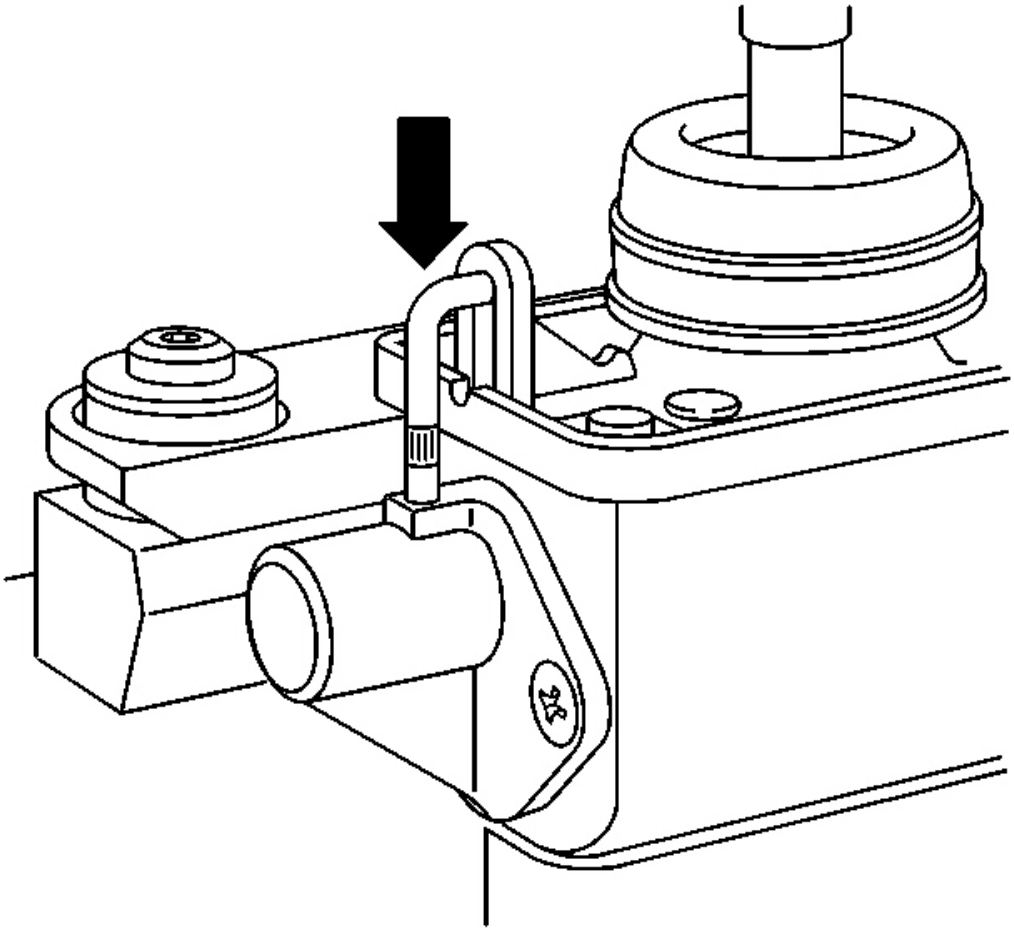


Fig. 52: Shift Control Neutral Lock Pin
Courtesy of GENERAL MOTORS CORP.

1. Apply the parking brake.

2. Remove the shift control closeout boot. Refer to **Shift Control Shift Closeout Boot Replacement**.
3. Place the shifter into NEUTRAL.
4. Press down to engage the shift control neutral lock pin.

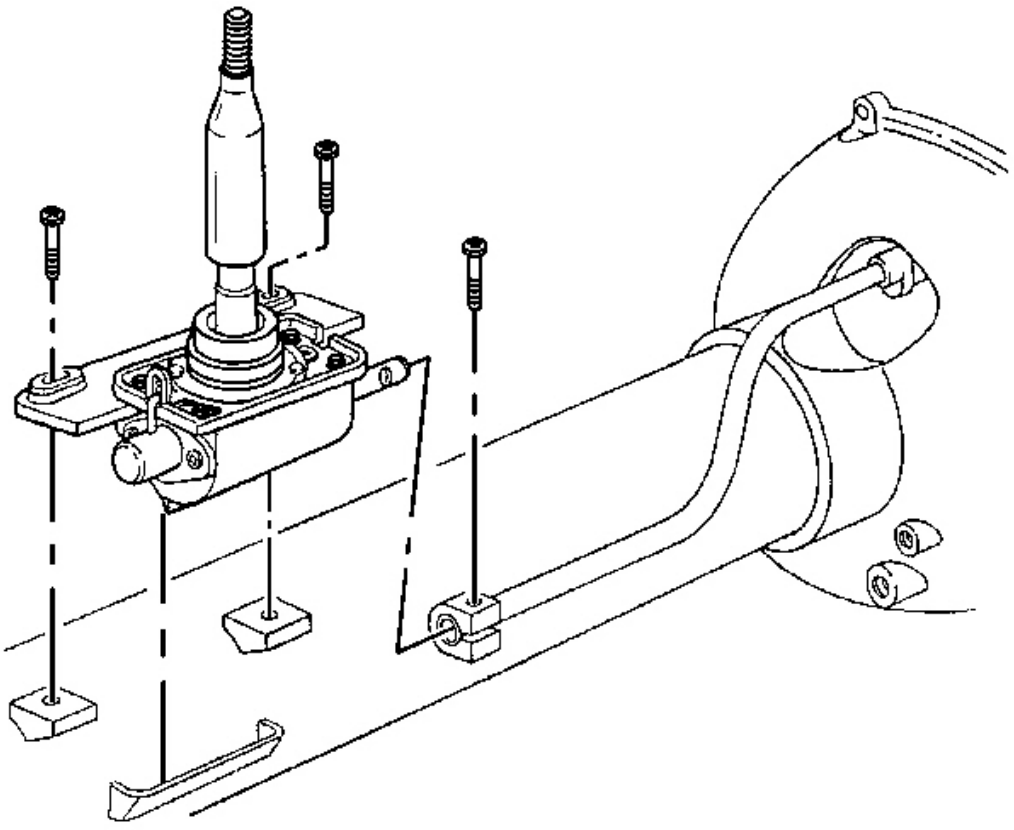


Fig. 53: Transmission Shift Rod, Clamp & Bolt
Courtesy of GENERAL MOTORS CORP.

5. Loosen the transmission shift rod clamp bolt.
6. Loosen the shift control mounting bolts.
7. Check that the shift control locator (on the underside of the shift control) is installed into the shifter bracket on the side of the driveline support assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

8. Tighten the shift control mounting bolts.

   Tighten: Tighten the shift control mounting bolts to 30 N.m (22 lb ft).

9. Tighten the transmission shift rod clamp bolt.

   Tighten: Tighten the transmission shift rod clamp bolt to 30 N.m (22 lb ft).

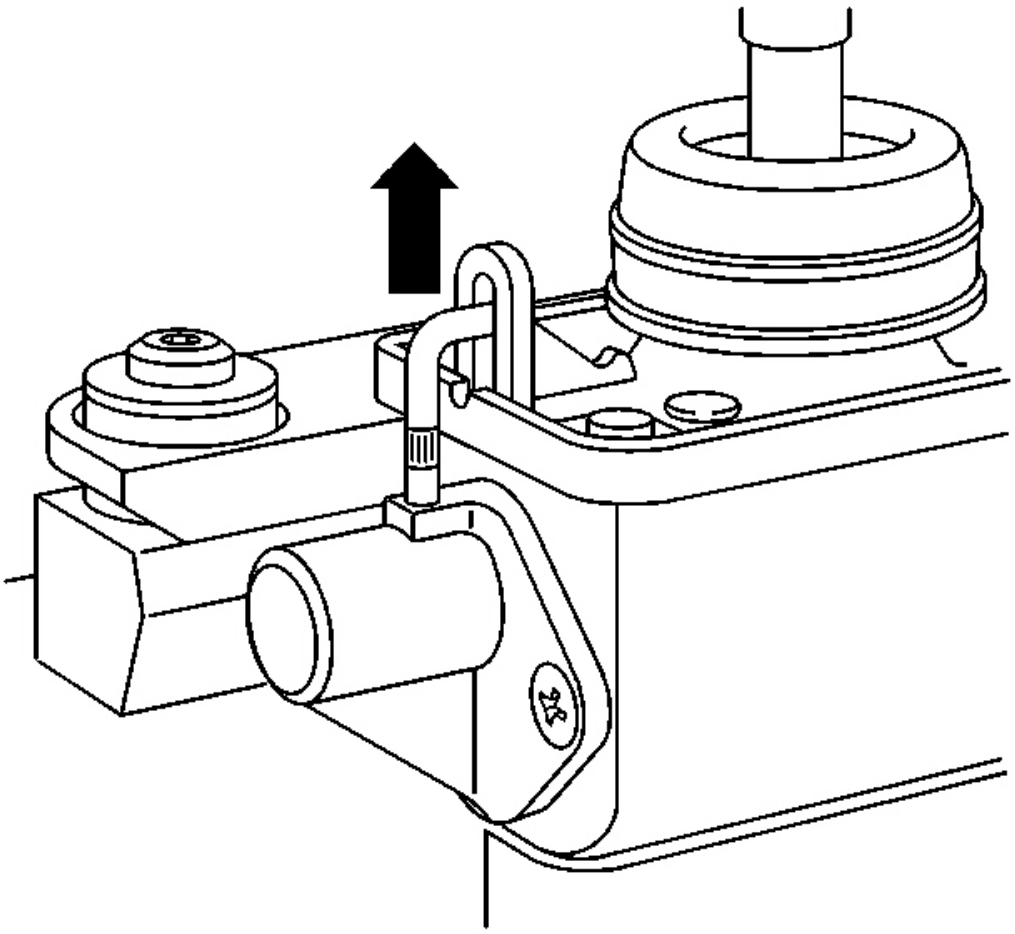


Fig. 54: Releasing The Shift Control Neutral Lock Pin
Courtesy of GENERAL MOTORS CORP.

10. Lift to release the shift control neutral lock pin.
11. Install the shift control closeout boot. Refer to **Shift Control Shift Closeout Boot Replacement**.
12. Release the parking brake.

BACKUP LAMP SWITCH REPLACEMENT

Removal Procedure

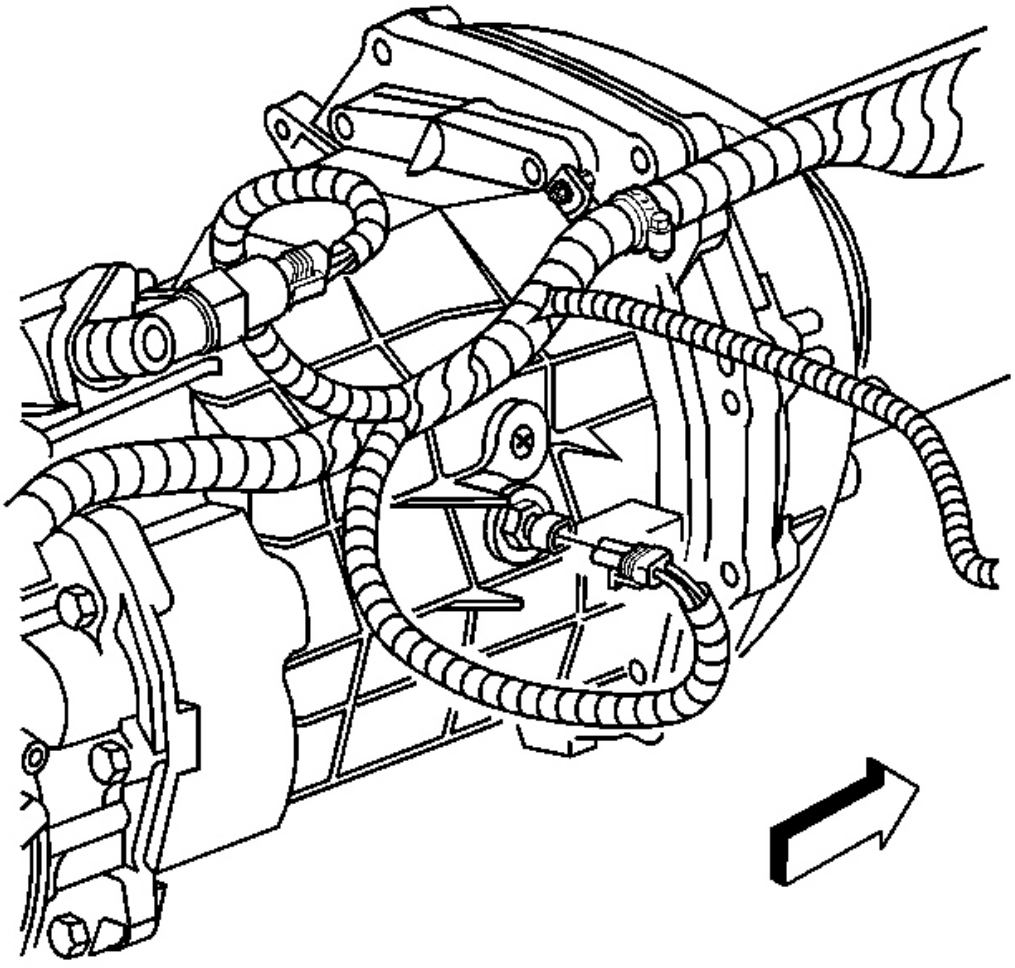


Fig. 55: Backup Lamp Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the catalytic converters. Refer to **Catalytic Converter Replacement - Left Side (6.0L)** or **Catalytic Converter Replacement - Left Side (7.0L)** and **Catalytic Converter Replacement - Right Side (6.0L)** or **Catalytic Converter Replacement - Right Side (7.0L)** .
3. Disconnect the backup lamp switch electrical connector.

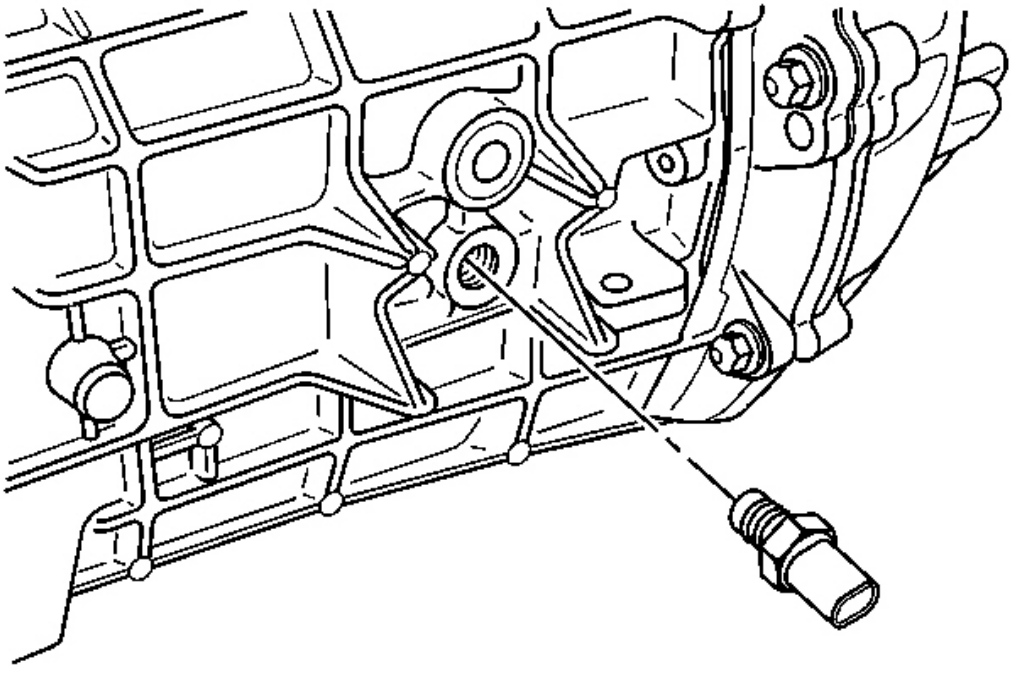


Fig. 56: Backup Lamp Switch
Courtesy of GENERAL MOTORS CORP.

4. Remove the backup lamp switch.

Installation Procedure

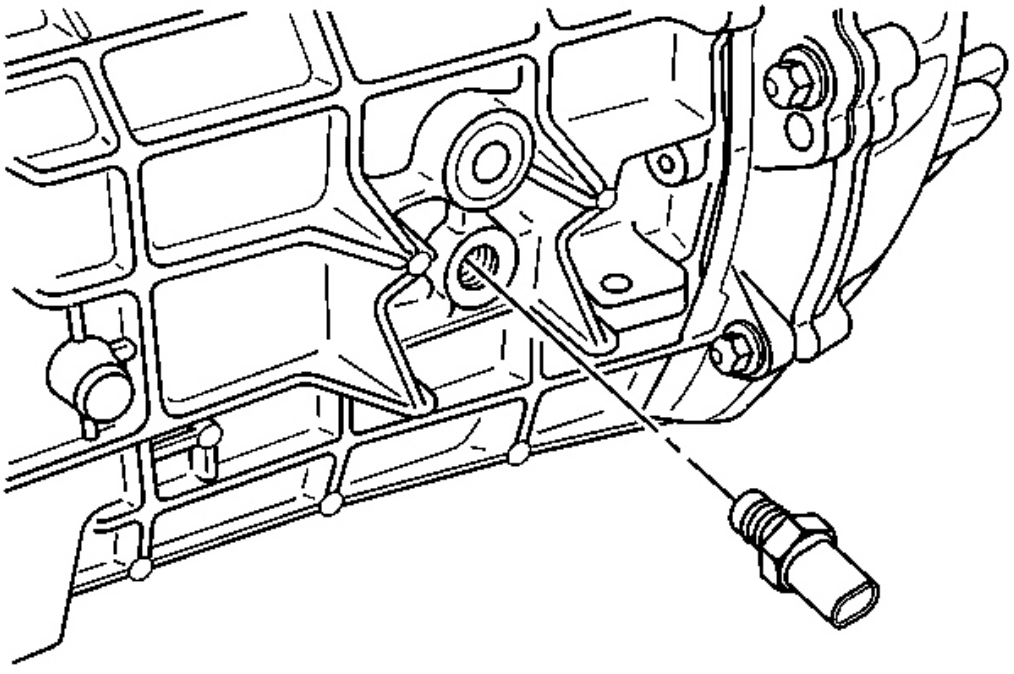


Fig. 57: Backup Lamp Switch
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

1. Install the backup lamp switch.

   Tighten: Tighten the backup lamp switch to 20 N.m (15 lb ft).

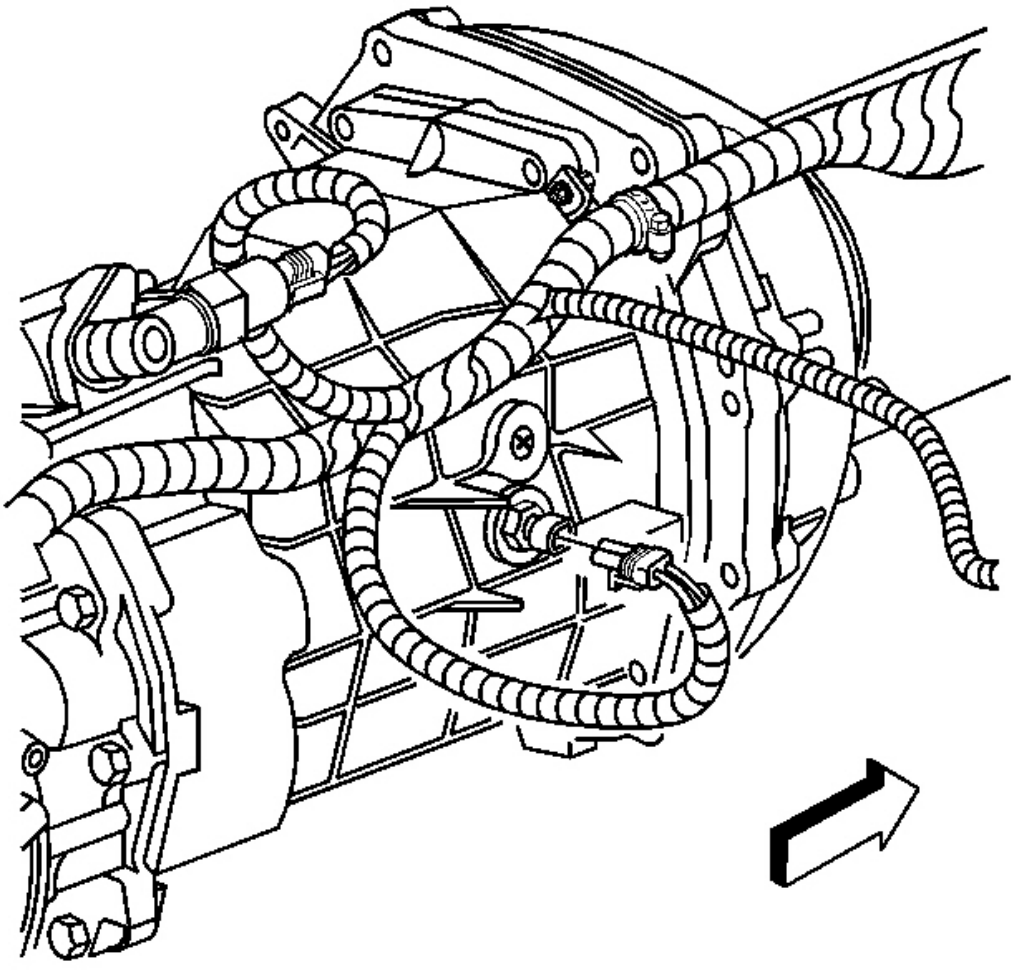


Fig. 58: Backup Lamp Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the backup lamp switch electrical connector.
3. Install the catalytic converters. Refer to **Catalytic Converter Replacement - Left Side (6.0L)** or **Catalytic Converter Replacement - Left Side (7.0L)** and **Catalytic Converter Replacement - Right Side (6.0L)** or **Catalytic Converter Replacement - Right Side (7.0L)** .
4. Lower the vehicle.

TRANSMISSION FLUID TEMPERATURE SENSOR REPLACEMENT

Removal Procedure

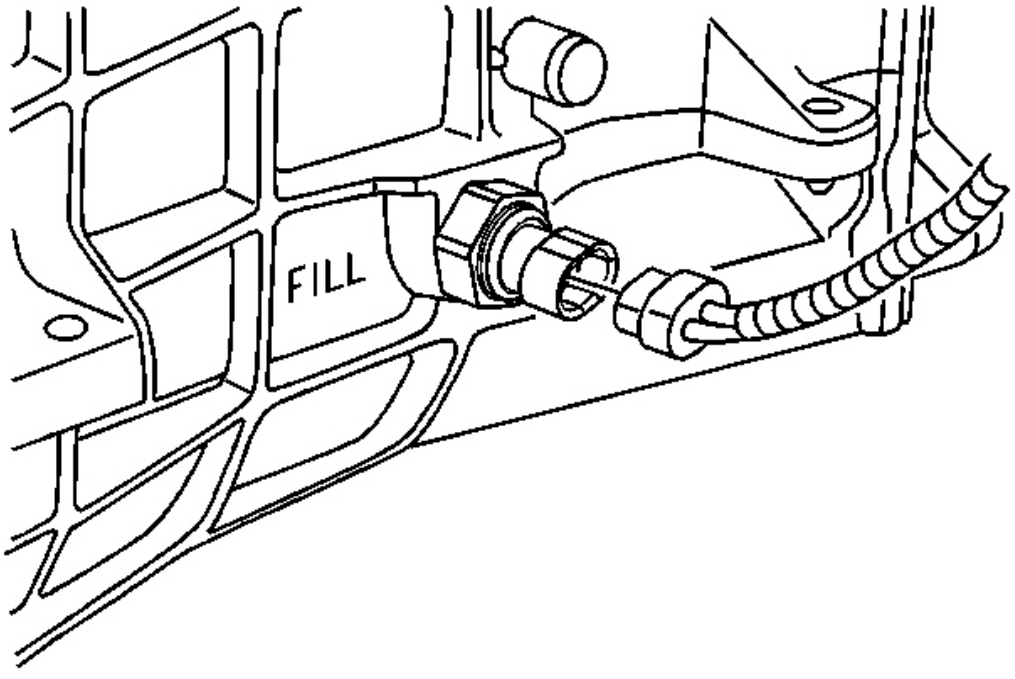


Fig. 59: Transmission Fluid Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the transmission fluid temperature sensor electrical connector.

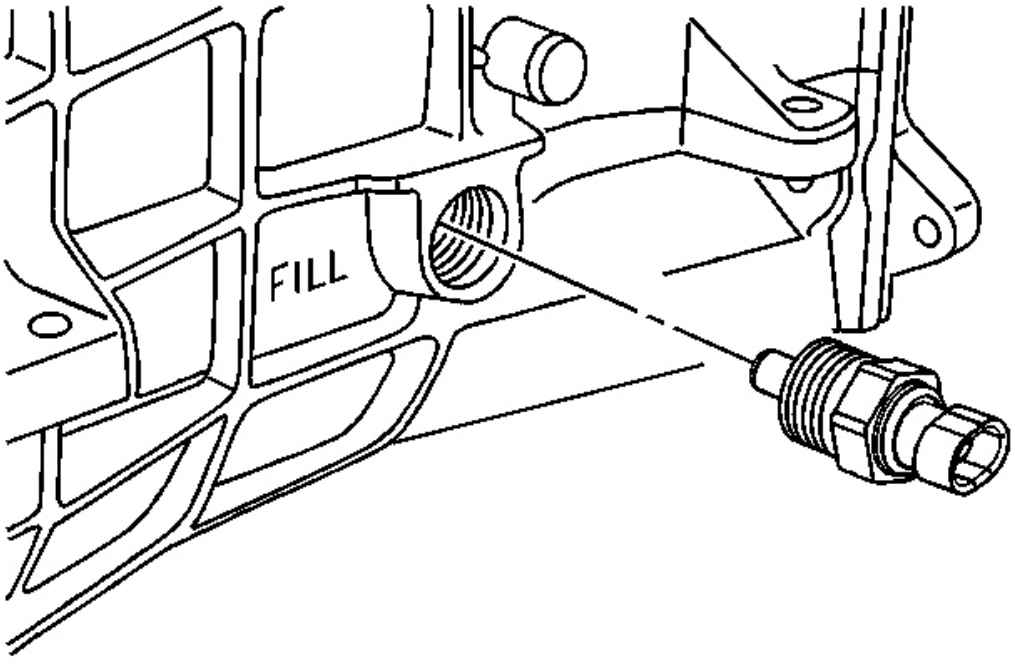


Fig. 60: Inspecting Transmission Fluid Level Is Even Bottom Of Fill Plug Hole
Courtesy of GENERAL MOTORS CORP.

3. Remove the transmission fluid temperature sensor.

Installation Procedure

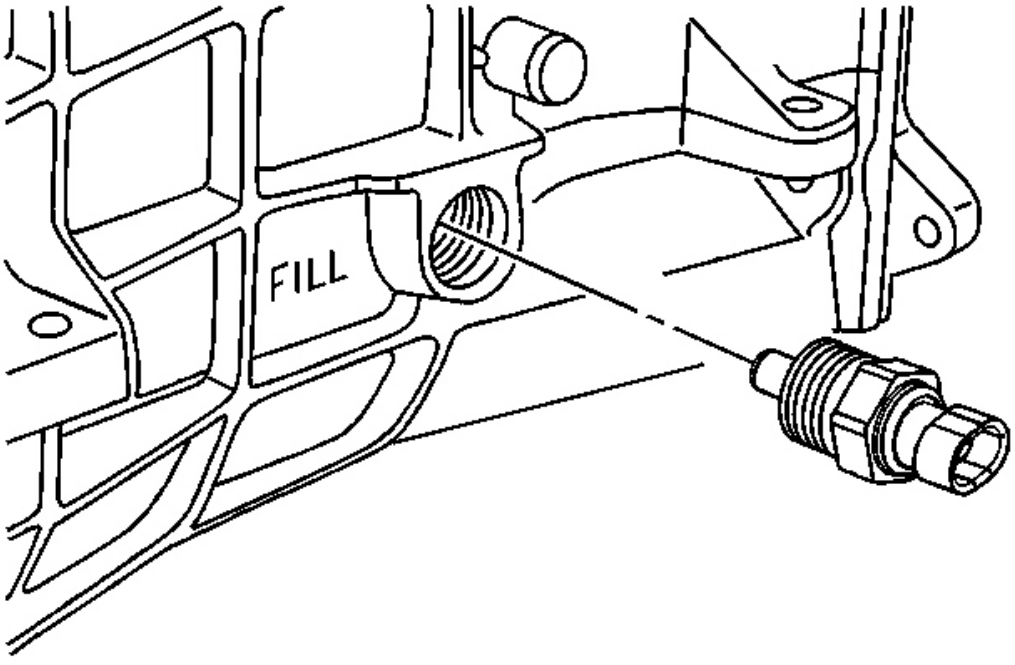


Fig. 61: Inspecting Transmission Fluid Level Is Even Bottom Of Fill Plug Hole
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the transmission fluid temperature sensor.

   Tighten: Tighten the transmission fluid temperature sensor to 27 N.m (20 lb ft).

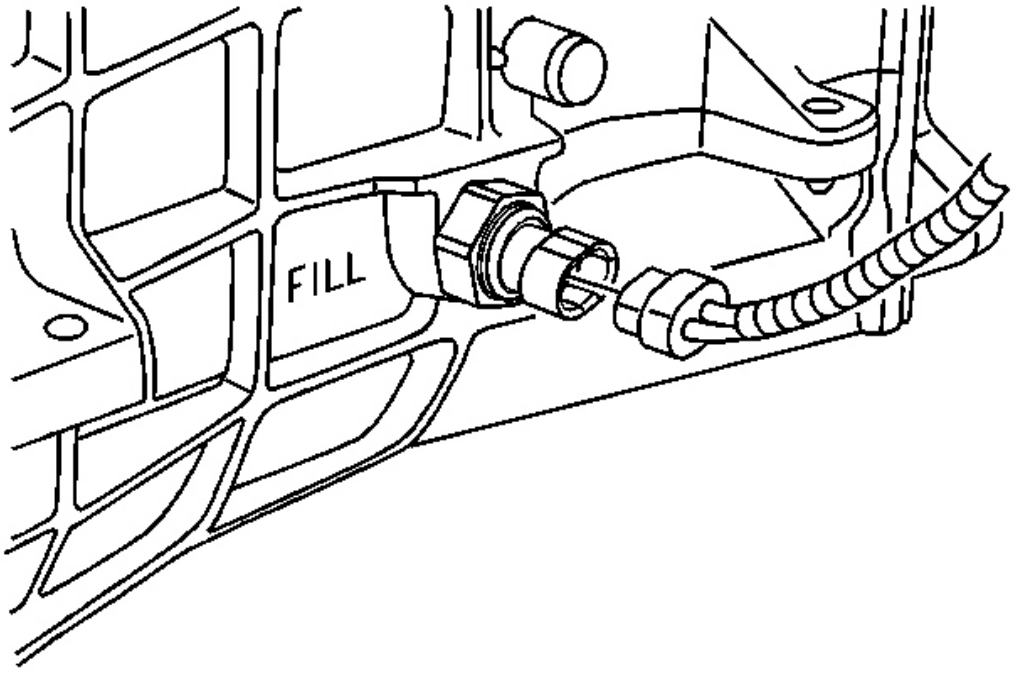


Fig. 62: Transmission Fluid Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the transmission fluid temperature sensor electrical connector.
3. Lower the vehicle.

REVERSE LOCKOUT SOLENOID REPLACEMENT

Tools Required

J 41099 Gear Select/Reverse Lockout Solenoid Socket. See **Special Tools**.

Removal Procedure

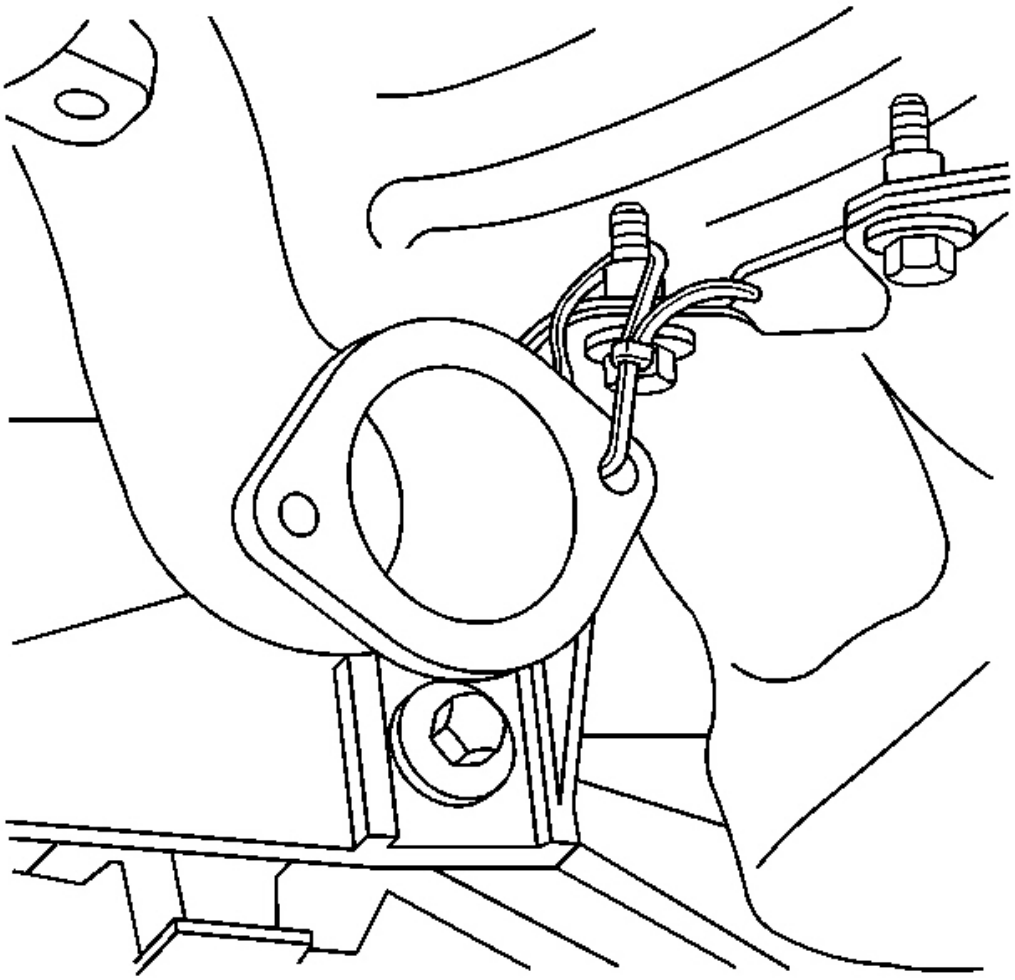


Fig. 63: Tying Off Muffler Assemblies To Underbody
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
3. Remove the rear tire and wheel assemblies. Refer to **Tire and Wheel Removal and**

Installation in Tires and Wheels.

4. Remove the intermediate exhaust pipe to muffler bolts.
5. Tie off the mufflers to the underbody to support out of the way.
6. Remove the rear transverse spring. Refer to **Rear Transverse Spring Replacement** in Rear Suspension.
7. Disconnect the wiring harness and brake pipe clip retainers from the rear suspension crossmember.
8. Position a transmission jack under the rear suspension crossmember and firmly secure the crossmember to the jack.
9. Using ONLY HAND TOOLS, remove the rear suspension crossmember mounting nuts.

IMPORTANT: Observe the clearance between the driveline and the driveline tunnel closeout panel.

10. Slowly lower the rear suspension crossmember, along with the attached driveline, approximately 4 cm (11/2 in).

    (Lower the rear suspension crossmember and driveline for access to the reverse lockout solenoid.)

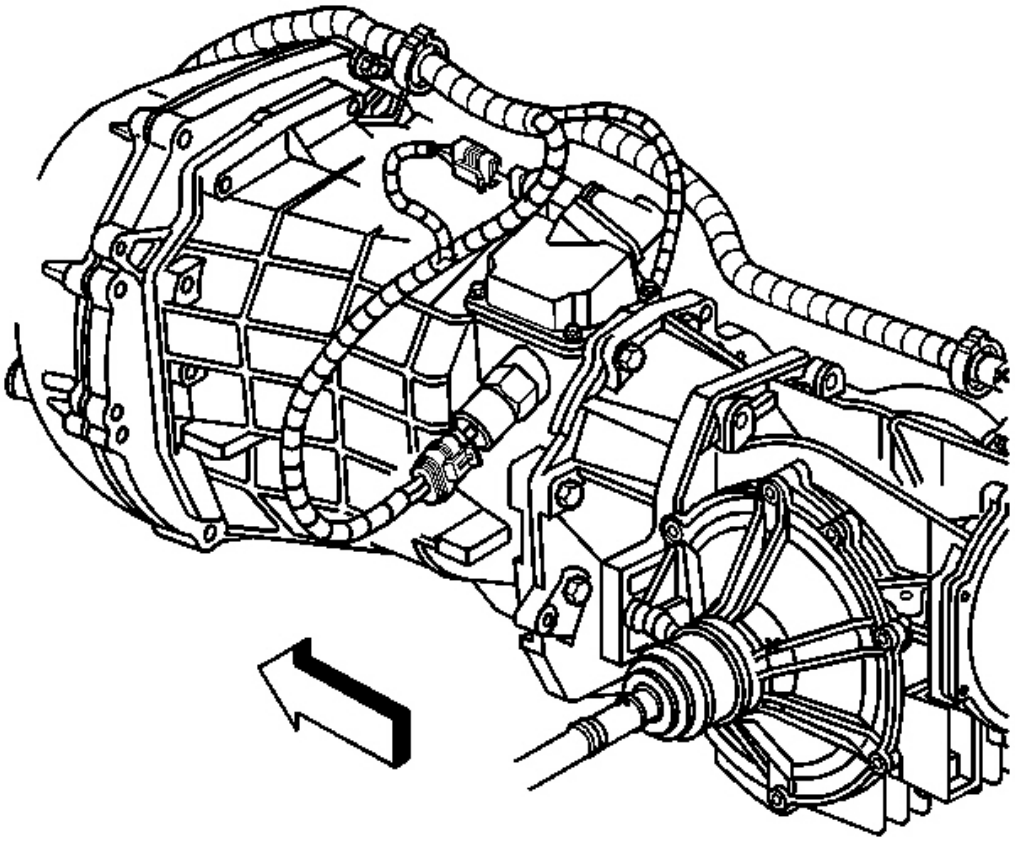


Fig. 64: Reverse Lockout Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

11. Disconnect the reverse lockout solenoid electrical connector.

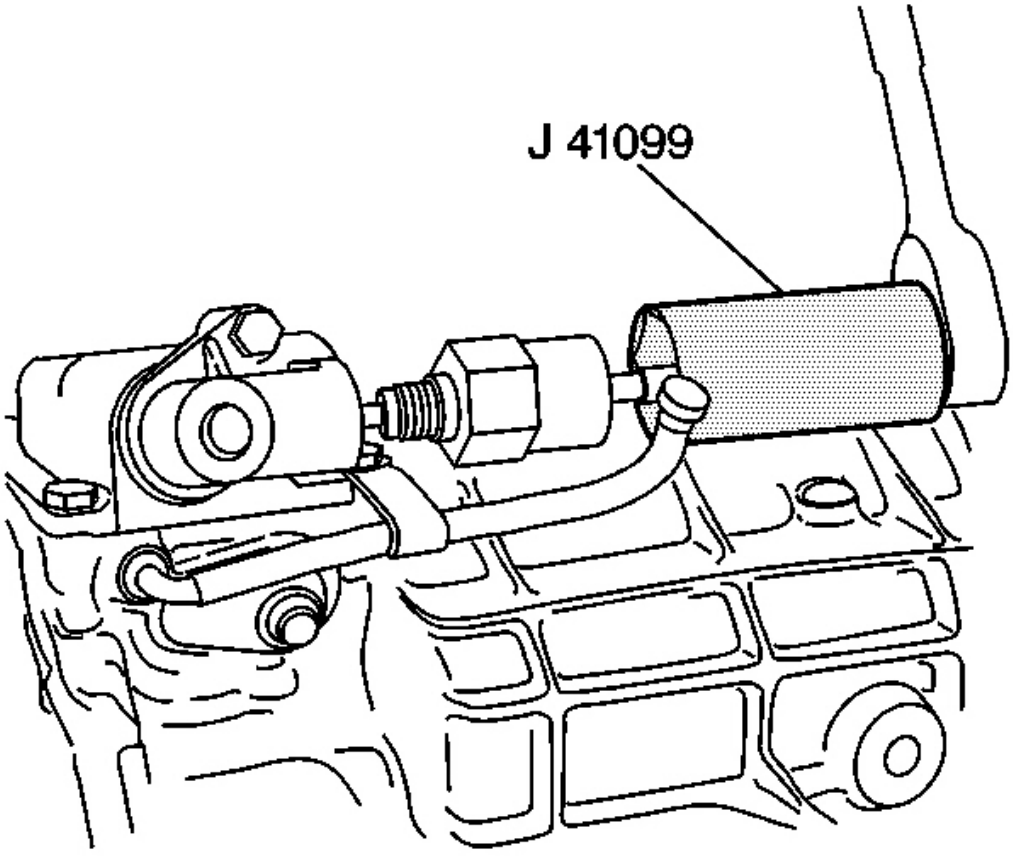


Fig. 65: J 41099 & Reverse Lockout Solenoid
Courtesy of GENERAL MOTORS CORP.

12. Using the **J 41099** , remove the reverse lockout solenoid. See **Special Tools**.

Installation Procedure

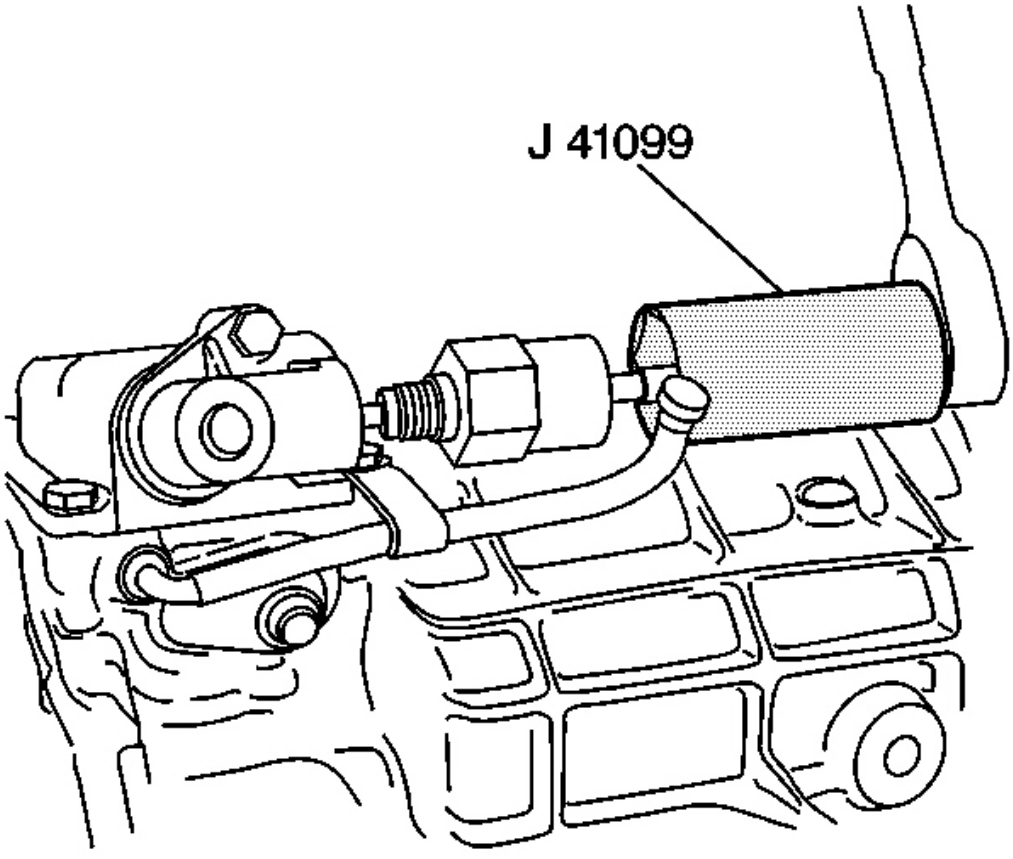


Fig. 66: J 41099 & Reverse Lockout Solenoid
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Using the **J 41099** , install the reverse lockout solenoid. See **Special Tools**.

   Tighten: Tighten the reverse lockout solenoid to 40 N.m (30 lb ft).

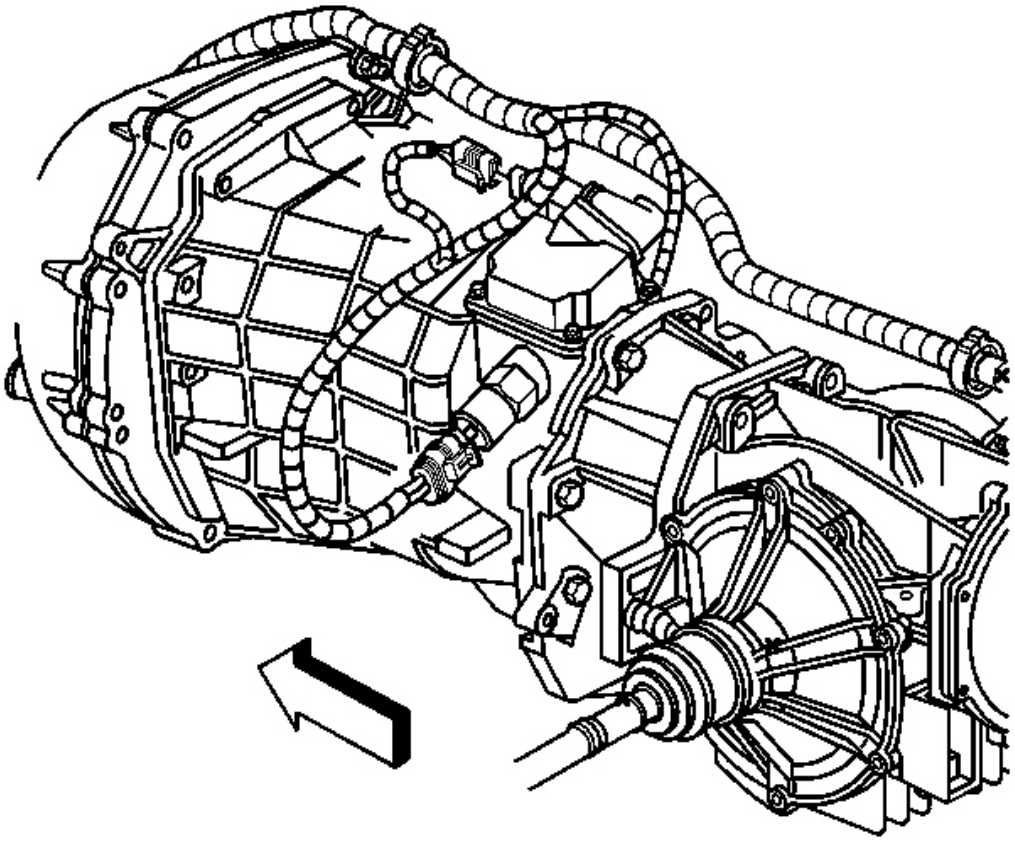


Fig. 67: Reverse Lockout Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the reverse lockout solenoid electrical connector.

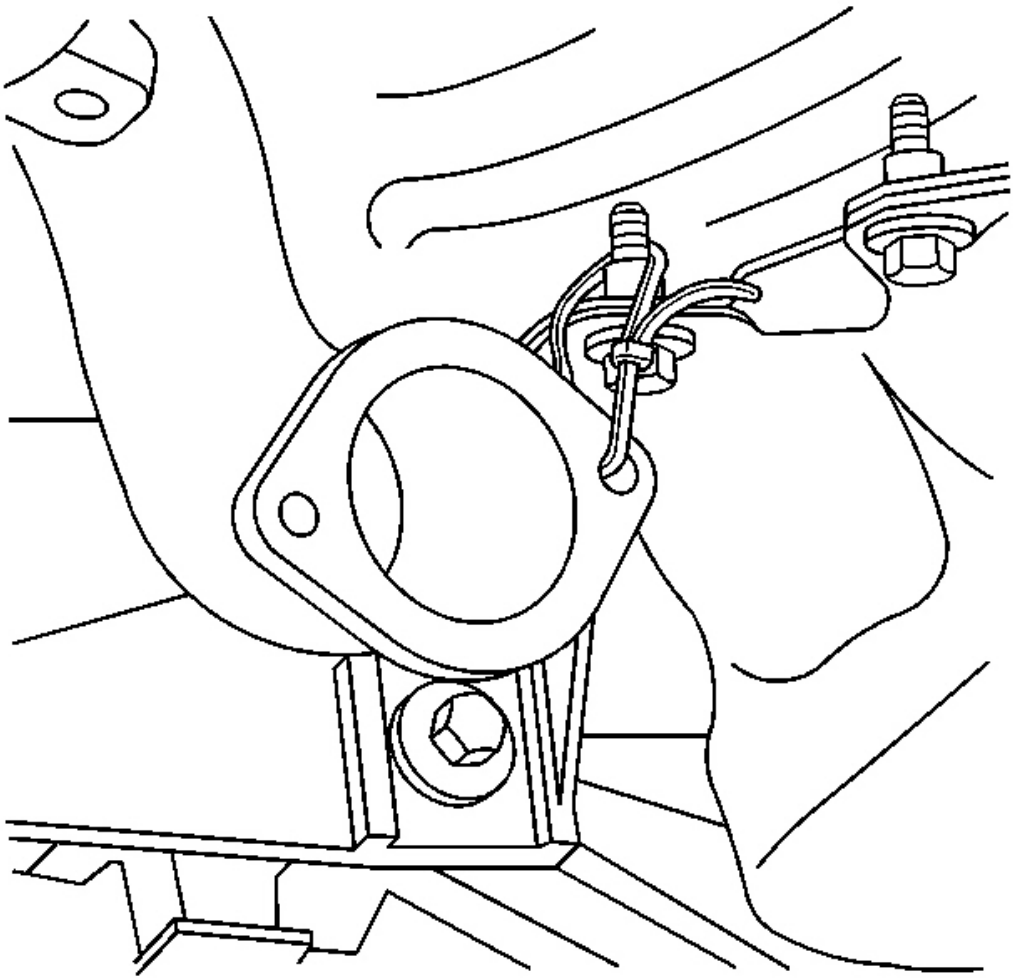


Fig. 68: Tying Off Muffler Assemblies To Underbody
Courtesy of GENERAL MOTORS CORP.

3. Slowly raise the rear suspension crossmember to seat to the vehicle frame rails.
4. Using ONLY HAND TOOLS, install NEW rear suspension crossmember mounting nuts.

   Tighten: Tighten the rear suspension crossmember mounting nuts to 110 N.m (81 lb ft).

5. Remove the transmission jack from the rear suspension crossmember.
6. Connect the wiring harness and brake pipe clip retainers to the rear suspension crossmember.

7. Install the rear transverse spring. Refer to **Rear Transverse Spring Replacement** in Rear Suspension.
8. Remove the tie-off retainers from the muffler assemblies.
9. Install the intermediate exhaust pipe to muffler bolts.

   Tighten: Tighten the intermediate exhaust pipe to muffler bolts to 50 N.m (37 lb ft).

10. Install the rear tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
11. Lower the vehicle.
12. Connect the negative battery cable.

    Tighten: Tighten the negative battery cable bolt to 15 N.m (11 lb ft).

13. Program the transmitters. Refer to **Transmitter Programming (Domestic and Japan)** or **Transmitter Programming (Export - Including Canada)** in Keyless Entry.

GEAR SELECT/SKIP SHIFT SOLENOID REPLACEMENT

Tools Required

J 41099 Gear Select/Reverse Lockout Solenoid Socket. See **Special Tools**.

Removal Procedure

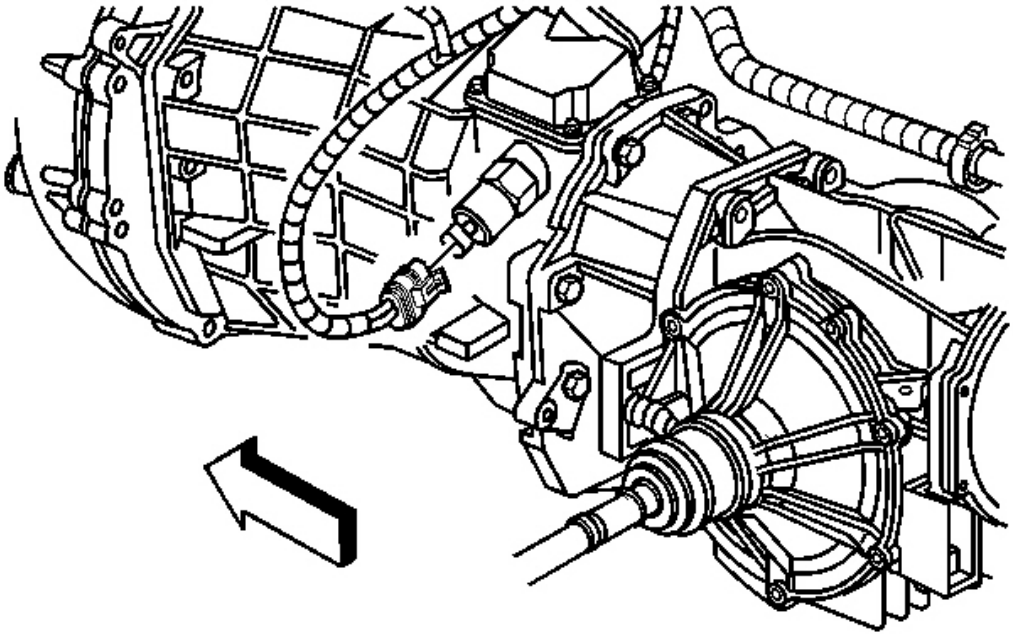


Fig. 69: Gear Select (Skip Shift) Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Disconnect the gear select solenoid electrical connector.

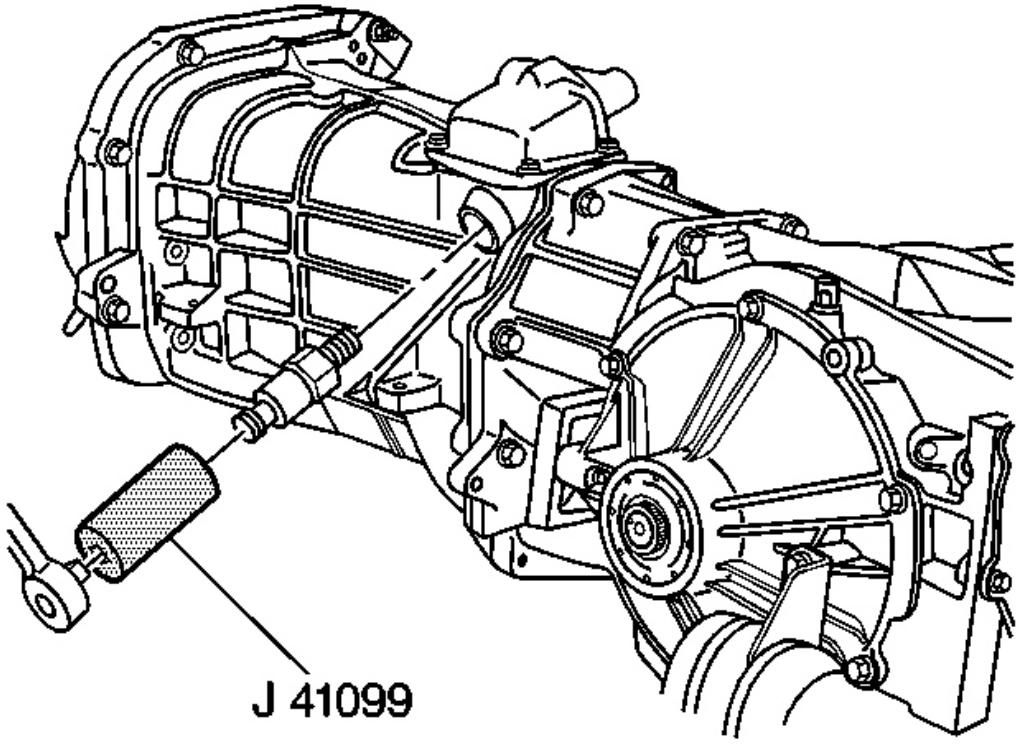


Fig. 70: J 41099 & Gear Select Solenoid
Courtesy of GENERAL MOTORS CORP.

3. Using the **J 41099** , remove the gear select solenoid. See **Special Tools**.

Installation Procedure

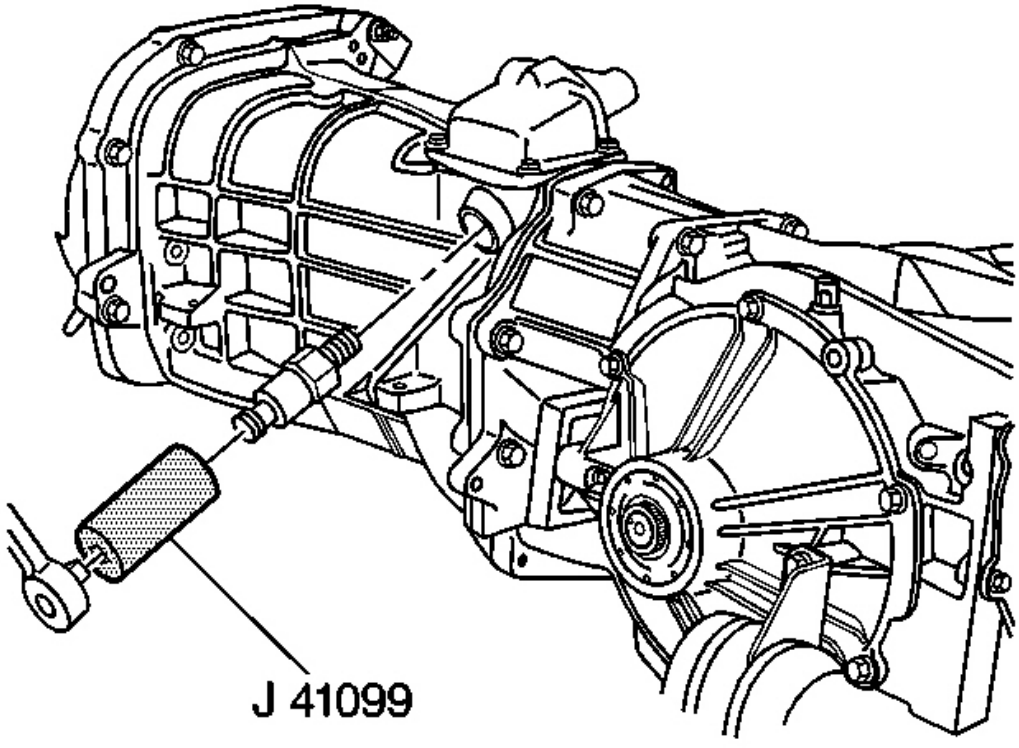


Fig. 71: J 41099 & Gear Select Solenoid
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Using the **J 41099** , install the gear select (skip shift) solenoid. See **Special Tools**.

   Tighten: Tighten the gear select solenoid to 40 N.m (30 lb ft).

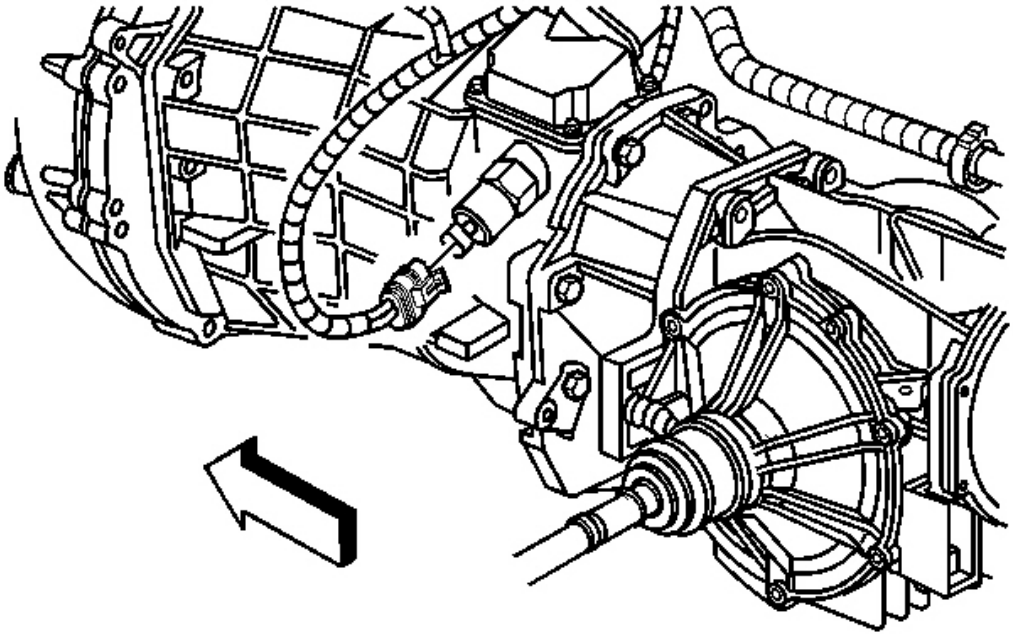


Fig. 72: Gear Select (Skip Shift) Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the gear select solenoid electrical connector.
3. Lower the vehicle.

TRANSMISSION FLUID REPLACEMENT

Draining Procedure

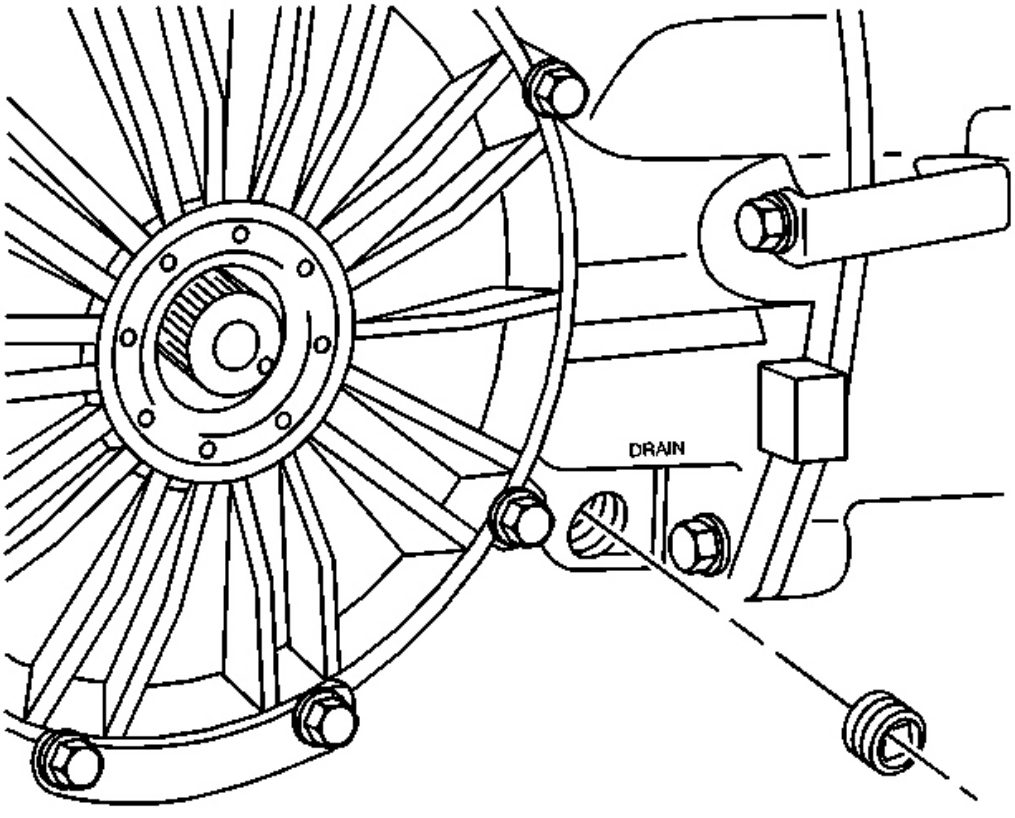


Fig. 73: Transmission Fluid Drain Plug
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle; ensure that the vehicle is level. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Clean away all dirt and debris from the transmission fluid drain plug area.
3. Remove the drain plug.
4. Allow the system to drain.

Filling Procedure

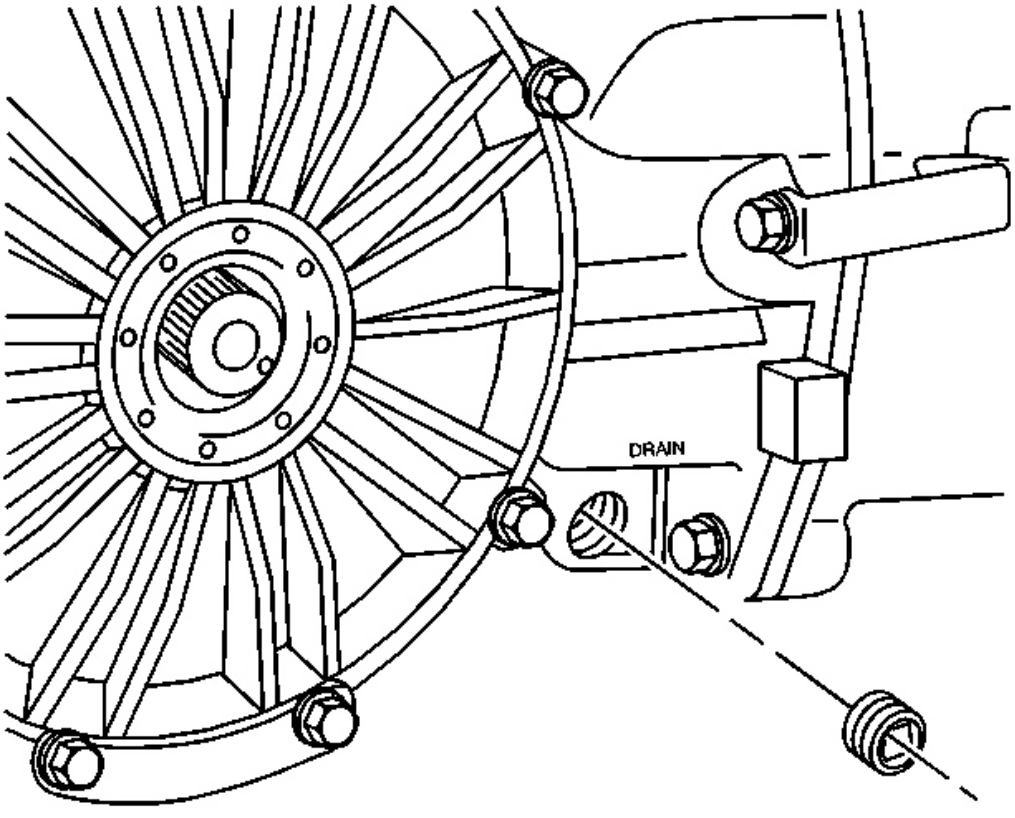


Fig. 74: Transmission Fluid Drain Plug
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Component Fastener Tightening Notice .

1. Install the transmission fluid drain plug.

   Tighten: Tighten the transmission fluid drain plug to 27 N.m (20 lb ft).

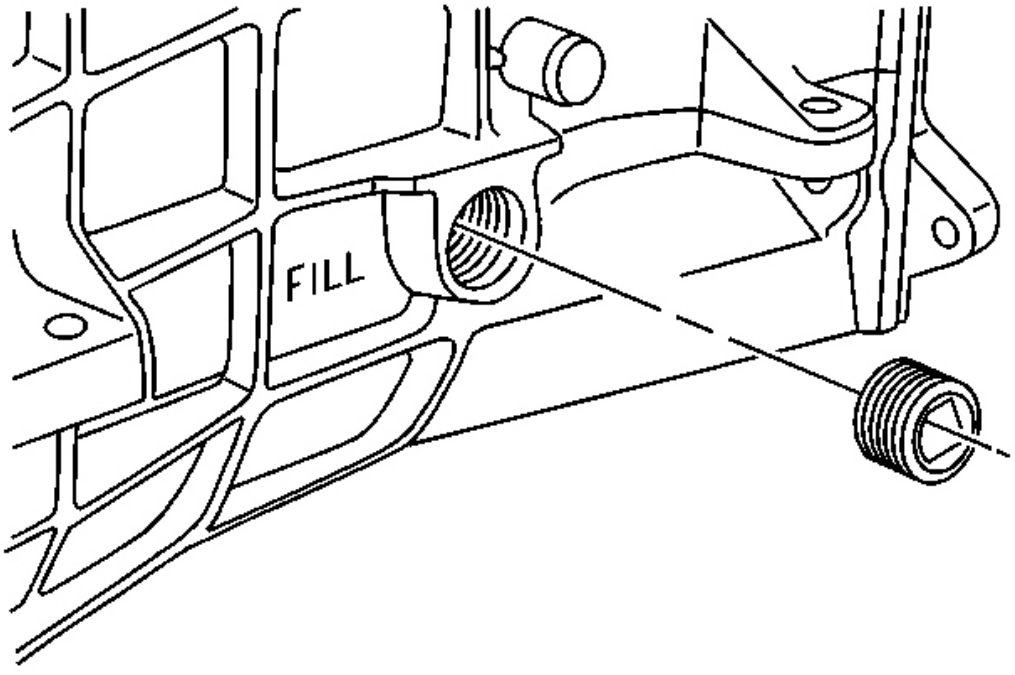


Fig. 75: Identifying Transmission Fill Plug
Courtesy of GENERAL MOTORS CORP.

2. Clean away all dirt and debris from the transmission fluid fill plug area.
3. Remove the fill plug.
4. Fill the transmission with DEXRON®-VI transmission fluid, until even with the bottom of the fill plug hole.
5. Install the transmission fluid fill plug.

   Tighten: Tighten the transmission fluid fill plug to 27 N.m (20 lb ft).

6. Lower the vehicle.

TRANSMISSION VENT TUBE REPLACEMENT

Removal Procedure

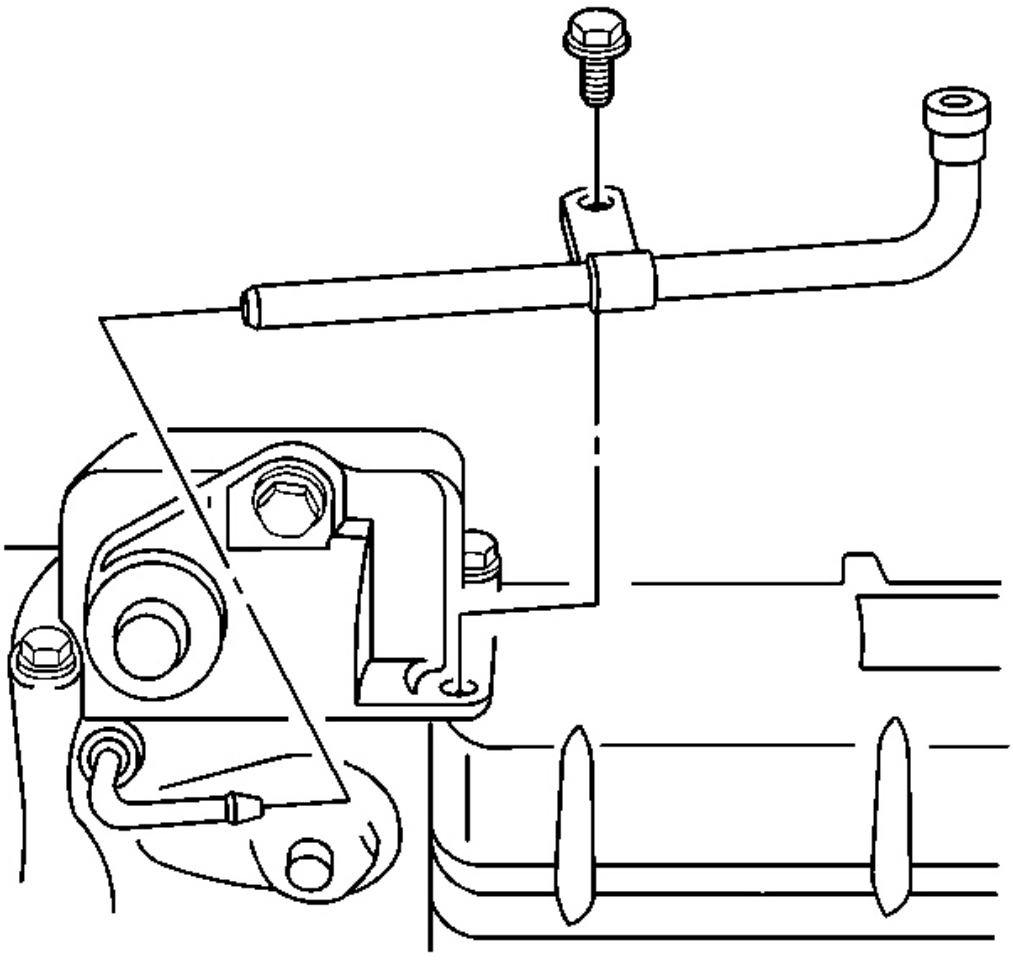


Fig. 76: Transmission Vent Tube & Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the reverse lockout solenoid. Refer to **Reverse Lockout Solenoid Replacement**.
3. Remove the transmission vent tube retaining bolt.
4. Remove the transmission vent tube.

Installation Procedure

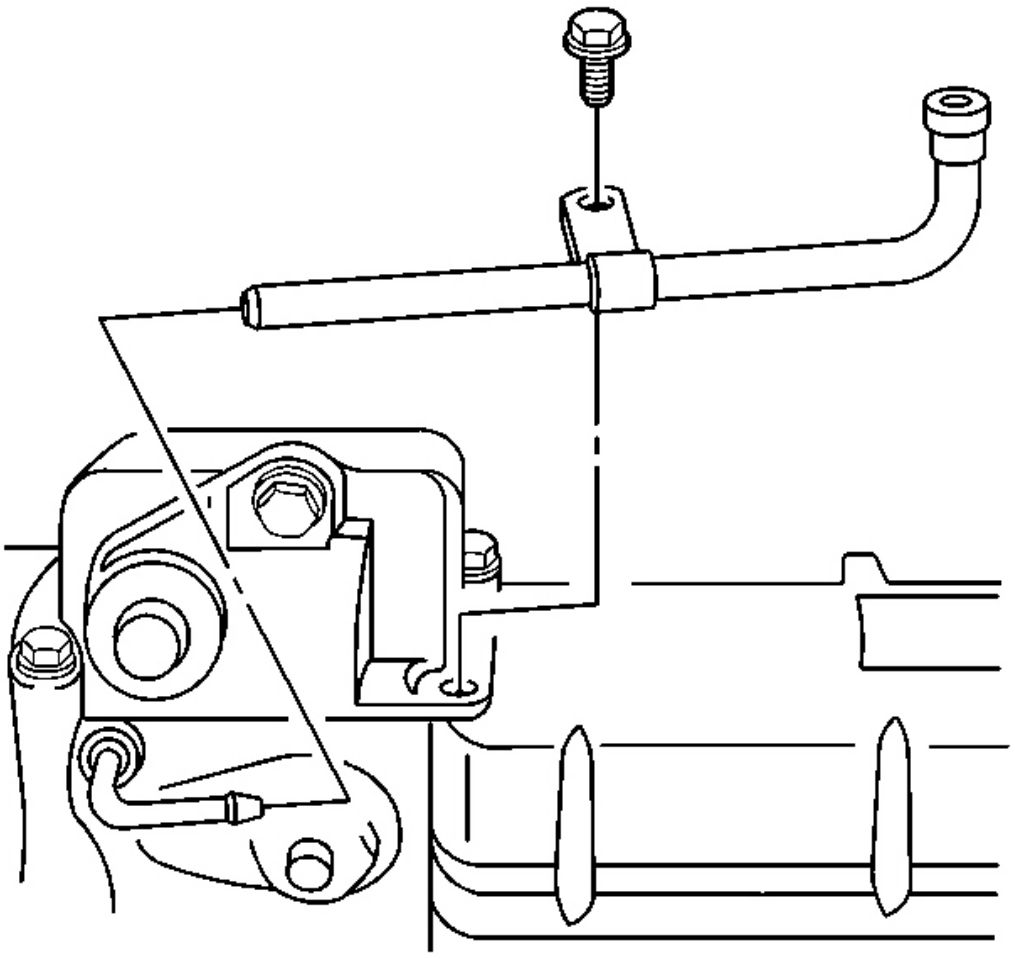


Fig. 77: Transmission Vent Tube & Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

1. Install the transmission vent tube.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the transmission vent tube retaining bolt.

Tighten: Tighten the transmission vent tube retaining bolt to 20 N.m (15 lb ft).

3. Install the reverse lockout solenoid. Refer to **Reverse Lockout Solenoid Replacement**.

4. Lower the vehicle.

TRANSMISSION FLUID COOLER HOSE/PIPE CONNECTOR REPLACEMENT (LOWER RADIATOR)

Removal Procedure

IMPORTANT: The transmission fluid cooler is held into position inside the radiator by the TOC fittings.
Service one TOC fitting at a time. Removal of both TOC fittings will cause the cooler tank to fall out of position and require radiator removal to install the TOC fittings.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Position a drain pan under the vehicle.
3. Disengage the plastic cap from the TOC fitting.

   Pull the plastic cap back along the pipe.

4. Disconnect the TOC line from the TOC fitting. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

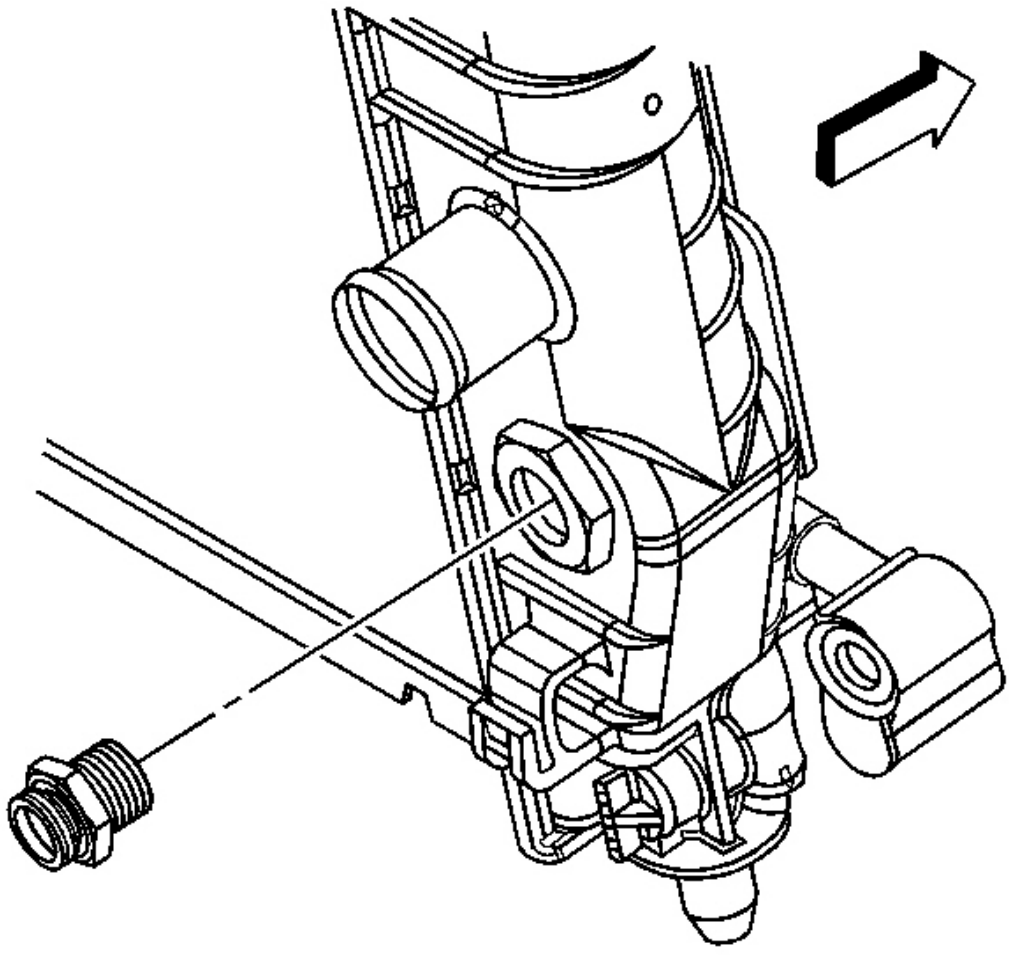


Fig. 78: TOC Fitting & Radiator (Lower Radiator)
Courtesy of GENERAL MOTORS CORP.

5. Remove the TOC fitting from the radiator.

Installation Procedure

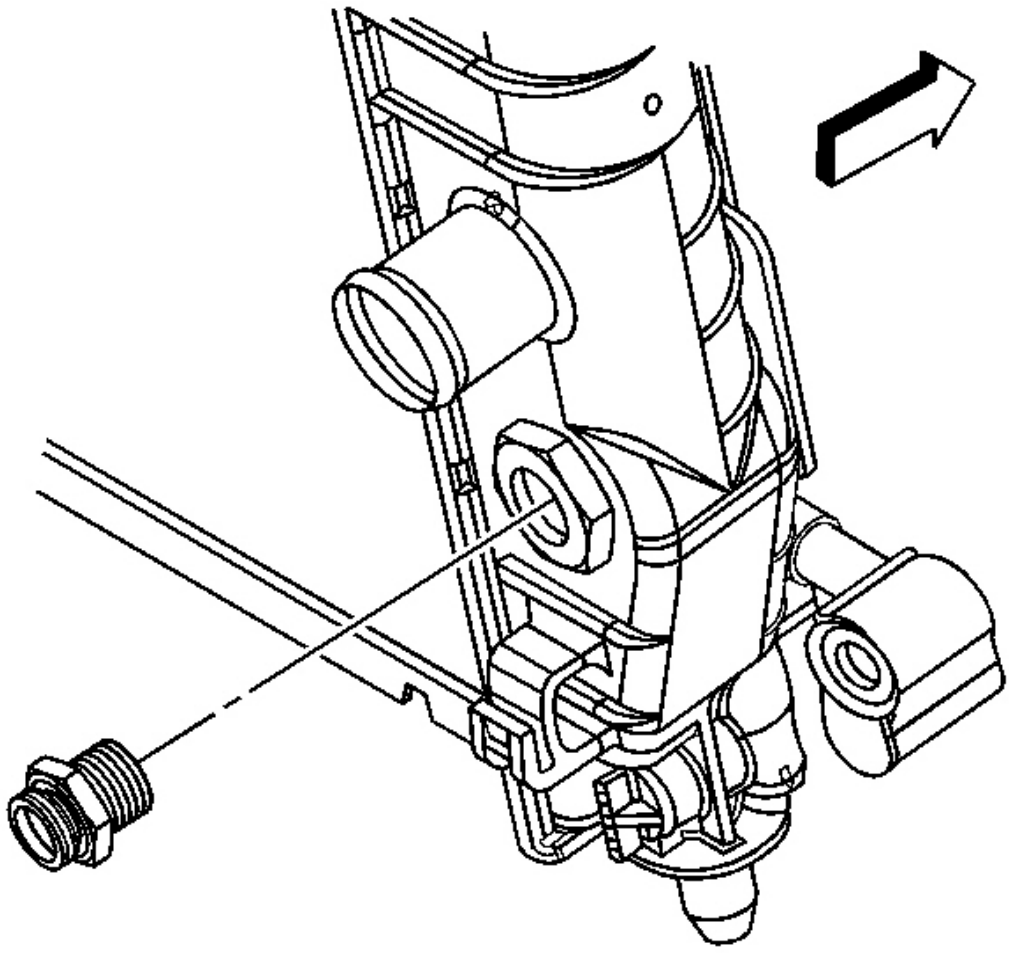


Fig. 79: TOC Fitting & Radiator (Lower Radiator)
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the TOC fitting to the radiator.

   Tighten: Tighten the fitting to 18 N.m (13 lb ft).

2. Connect the TOC line to the TOC fitting. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

IMPORTANT: Ensure the cooler line being installed has a plastic cap on the end that connects to the quick connect fitting. If no plastic cap exists, or the plastic cap is damaged, obtain a new cap. Install the cap on to the cooler line prior to cooler line installation.
Do not manually depress the retaining clip when installing the plastic cap.

3. Snap the plastic cap onto the TOC fitting.
4. Ensure that the plastic cap is fully seated against the fitting.

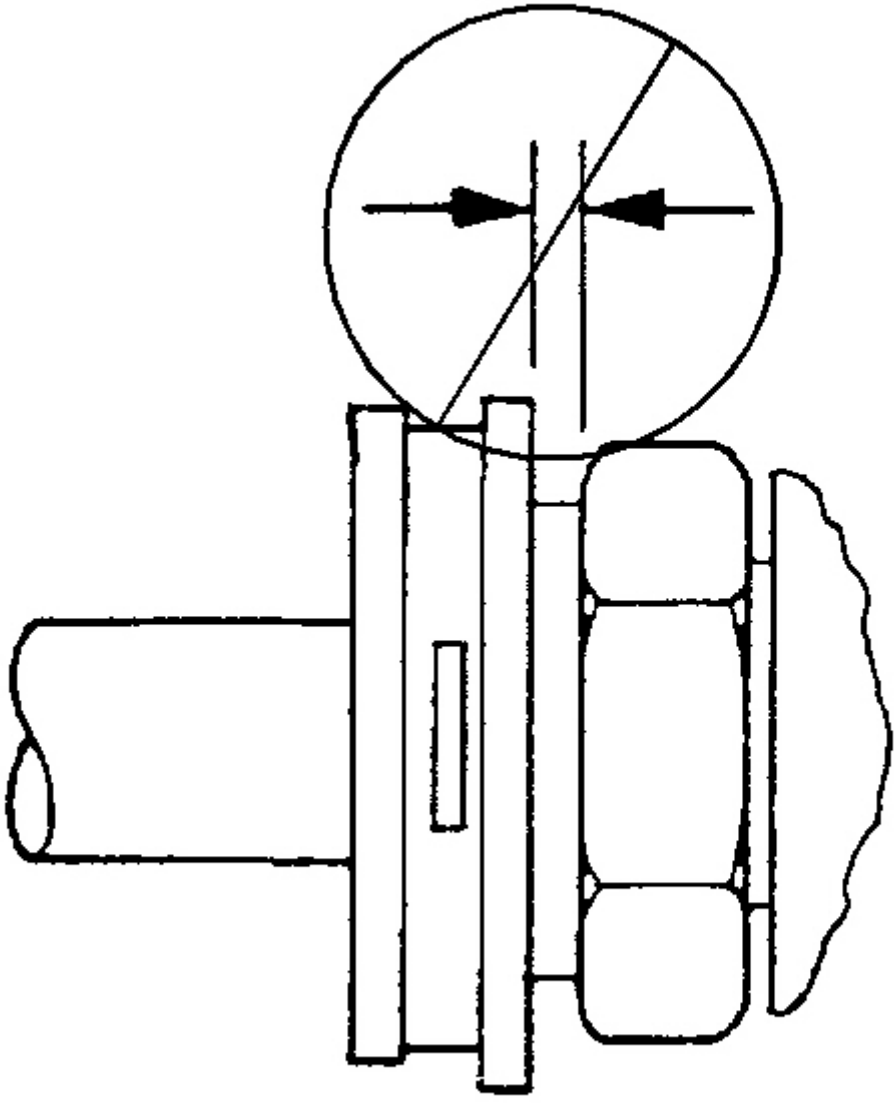


Fig. 80: Checking For Gap Between Cap & Fitting
Courtesy of GENERAL MOTORS CORP.

5. Ensure that no gap is present between the cap and the fitting.
6. Remove the drain pan from under the vehicle.
7. Lower the vehicle.

8. Inspect the fluid level and add fluid if necessary. Refer to **Transmission Fluid Level Inspection**.

TRANSMISSION FLUID COOLER HOSE/PIPE CONNECTOR REPLACEMENT (UPPER RADIATOR)

Removal Procedure

1. Remove the radiator support. Refer to **Radiator Support Replacement** in Engine Cooling.

IMPORTANT: The transmission fluid cooler is held into position inside the radiator by the TOC fittings.
Service one TOC fitting at a time. Removal of both TOC fittings will cause the cooler tank to fall out of position and require radiator removal to install the TOC fittings.

2. Disengage the plastic cap from the TOC fitting.

   Pull the plastic cap back along the pipe.

3. Disconnect the TOC line from the TOC fitting. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

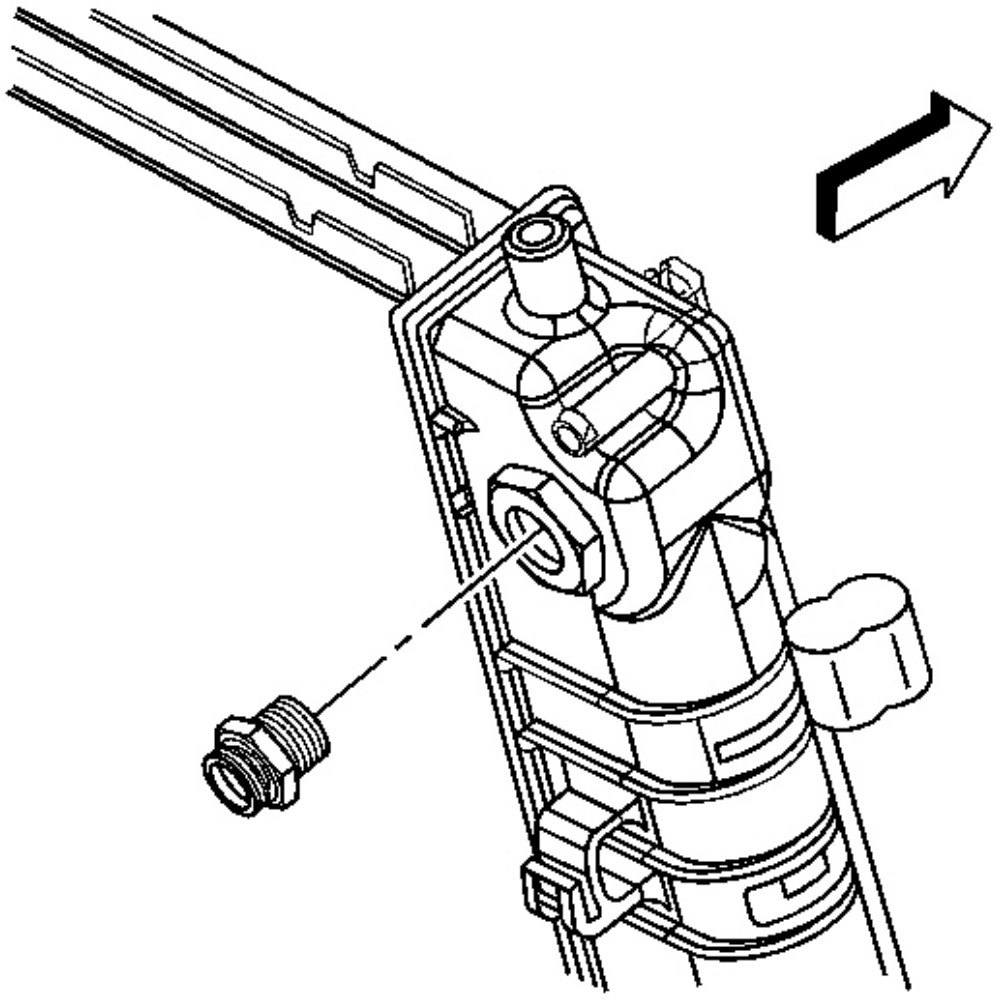


Fig. 81: TOC Fitting & Radiator (Upper Radiator)
Courtesy of GENERAL MOTORS CORP.

4. Remove the TOC fitting from the radiator.

Installation Procedure

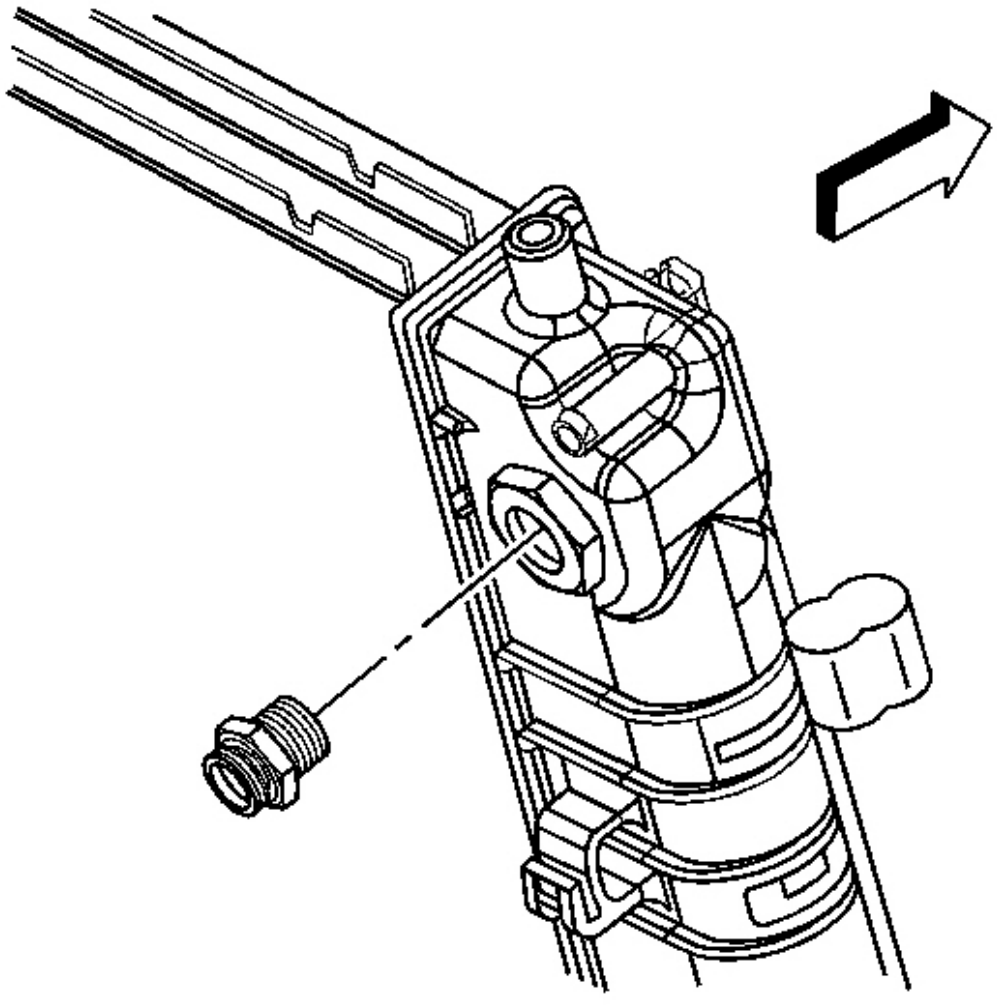


Fig. 82: TOC Fitting & Radiator (Upper Radiator)
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the TOC fitting to the radiator.

   Tighten: Tighten the fitting to 18 N.m (13 lb ft).

2. Connect the TOC line to the TOC fitting. Refer to **Transmission Fluid Cooler Hose/Pipe**

Quick-Connect Fitting Replacement.

IMPORTANT: Ensure the cooler line being installed has a plastic cap on the end that connects to the quick connect fitting. If no plastic cap exists, or the plastic cap is damaged, obtain a new cap. Install the cap on to the cooler line prior to cooler line installation.
Do not manually depress the retaining clip when installing the plastic cap.

3. Snap the plastic cap onto the TOC fitting.
4. Ensure that the plastic cap is fully seated against the fitting.

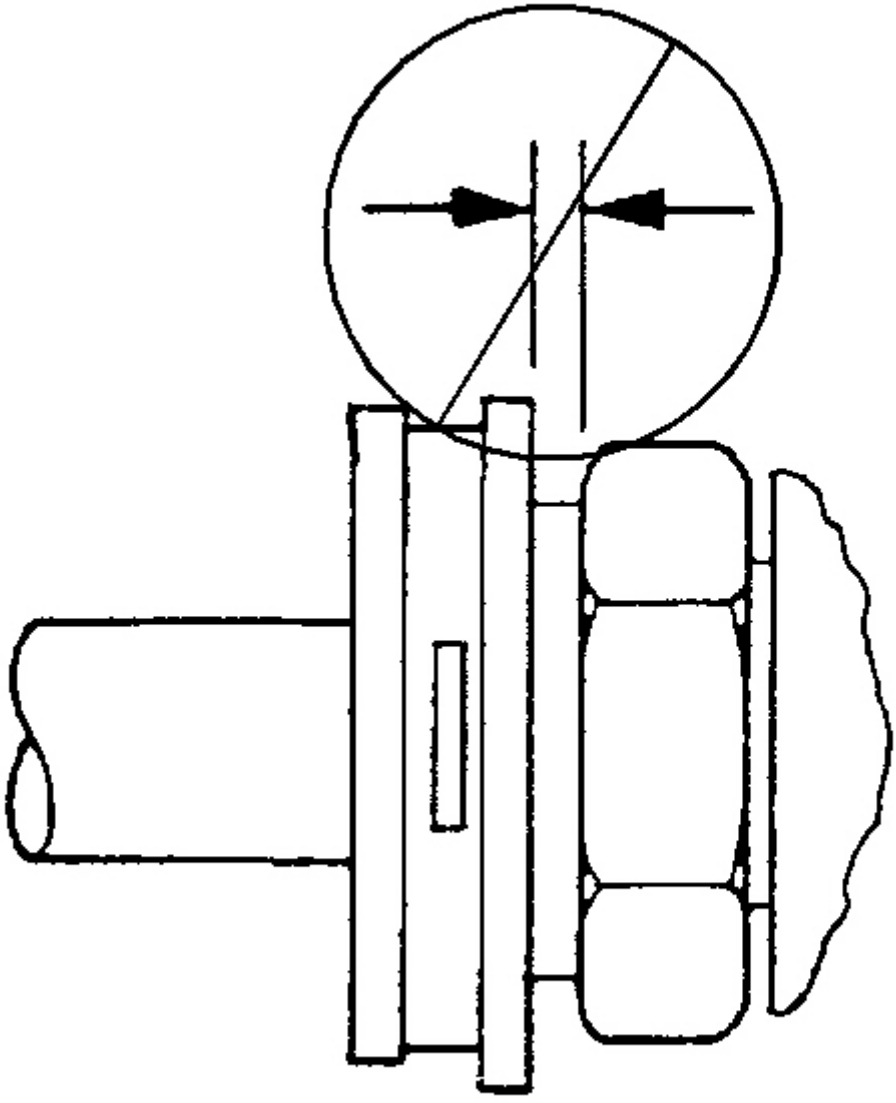


Fig. 83: Checking For Gap Between Cap & Fitting
Courtesy of GENERAL MOTORS CORP.

5. Ensure that no gap is present between the cap and the fitting.
6. Install the radiator support. Refer to **Radiator Support Replacement** in Engine Cooling.
7. Inspect the fluid level and add fluid if necessary. Refer to **Transmission Fluid Level**

Inspection.

TRANSMISSION FLUID COOLER HOSE/PIPE REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Install a drain pan under the vehicle.

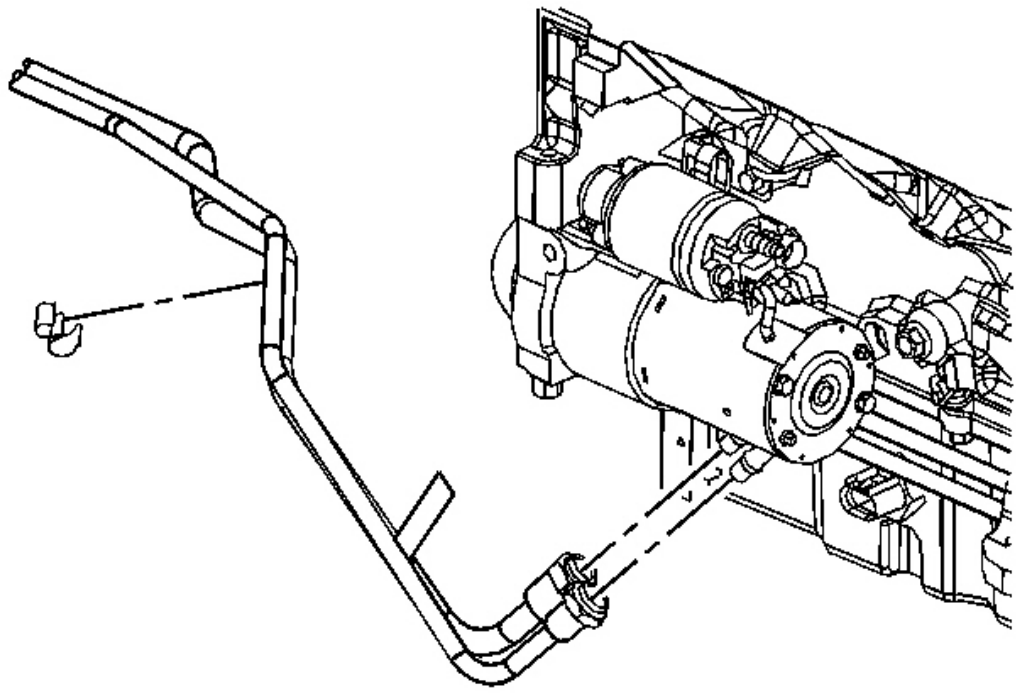


Fig. 84: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the upper transmission oil cooler line from the upper intermediate line. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
4. Disconnect the lower transmission oil cooler line from the lower intermediate line. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

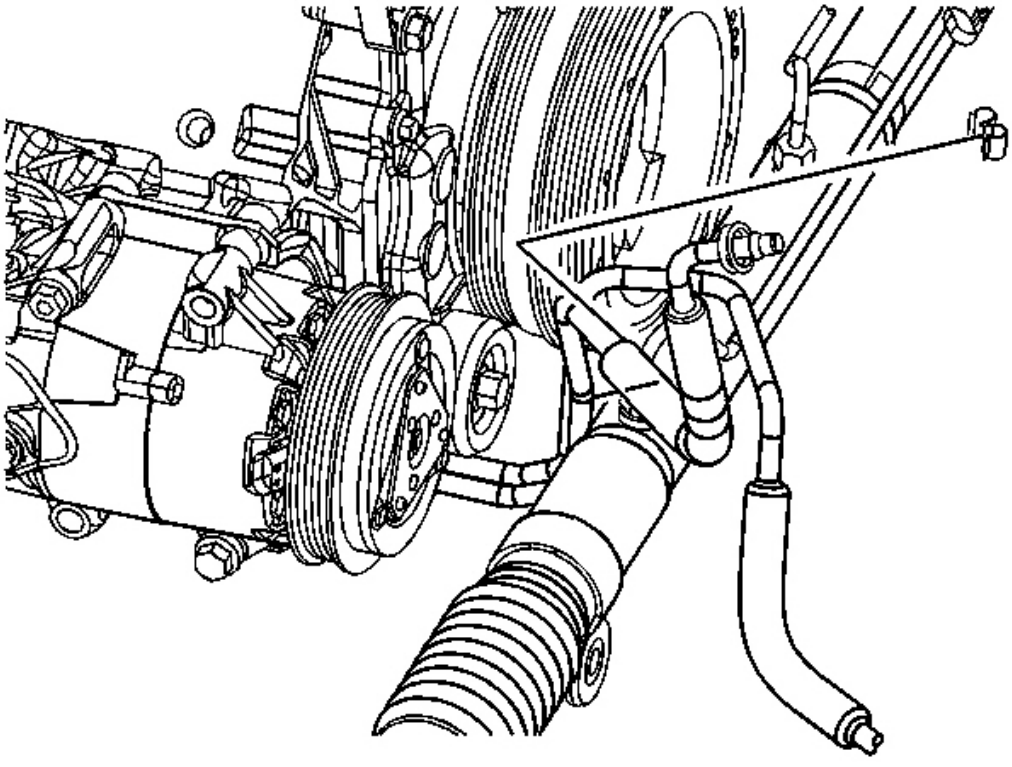


Fig. 85: Upper & Lower Transmission Line Front Clip
Courtesy of GENERAL MOTORS CORP.

5. Remove the clip holding the front upper and lower transmission lines.

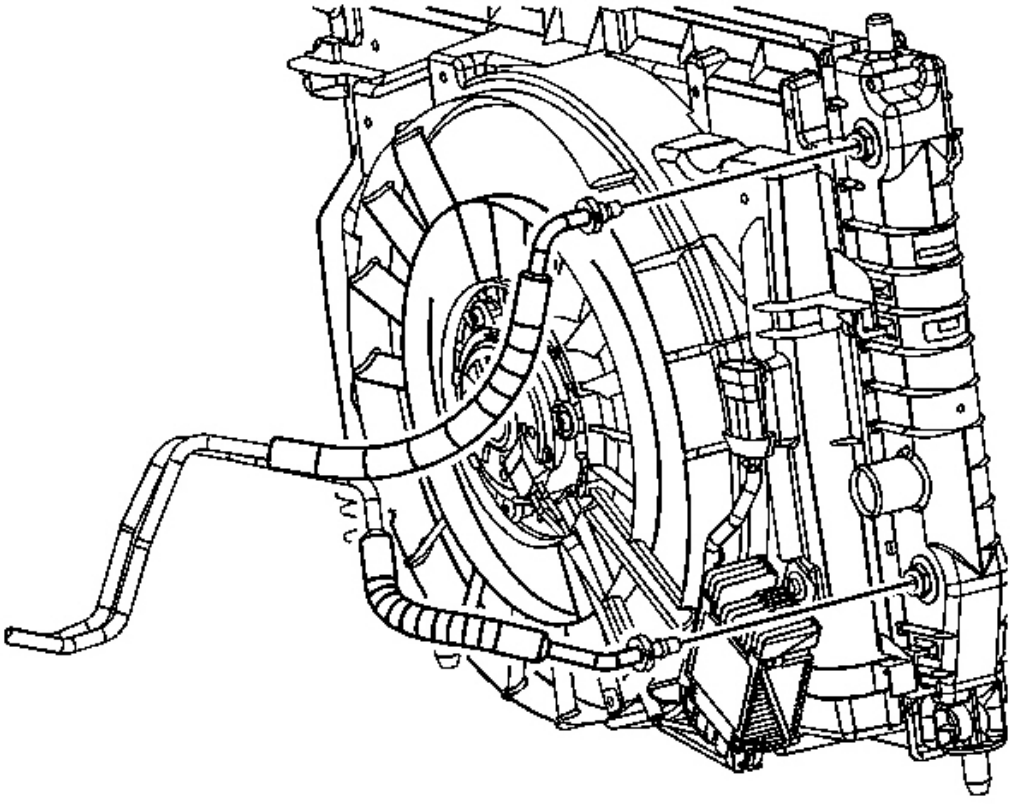


Fig. 86: Upper & Lower Transmission Oil Cooler Lines At Radiator
Courtesy of GENERAL MOTORS CORP.

6. Disconnect the upper transmission oil cooler line from the radiator. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
7. Disconnect the upper transmission oil cooler line from the radiator. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
8. Remove the engine mount. Refer to **Engine Mount Replacement - Right Side** for the 6.0L engine or **Engine Mount Replacement - Right Side** for the 7.0L engine.

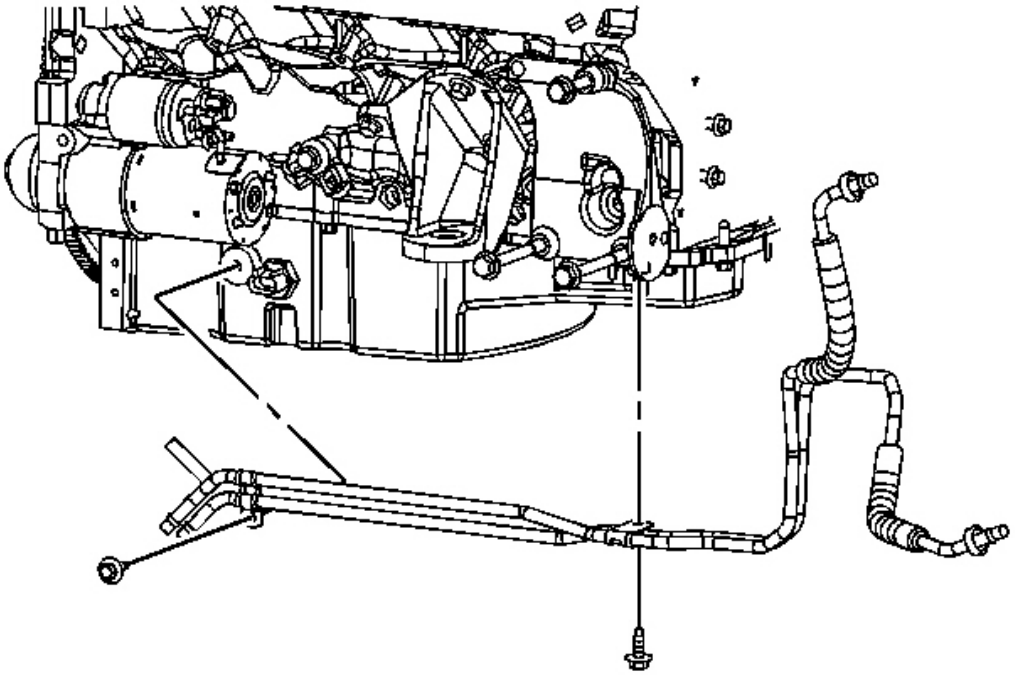


Fig. 87: Transmission Oil Cooler Lines & Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the front transmission oil cooler line bolts.
10. Remove the front transmission oil cooler lines from the vehicle.

Installation Procedure

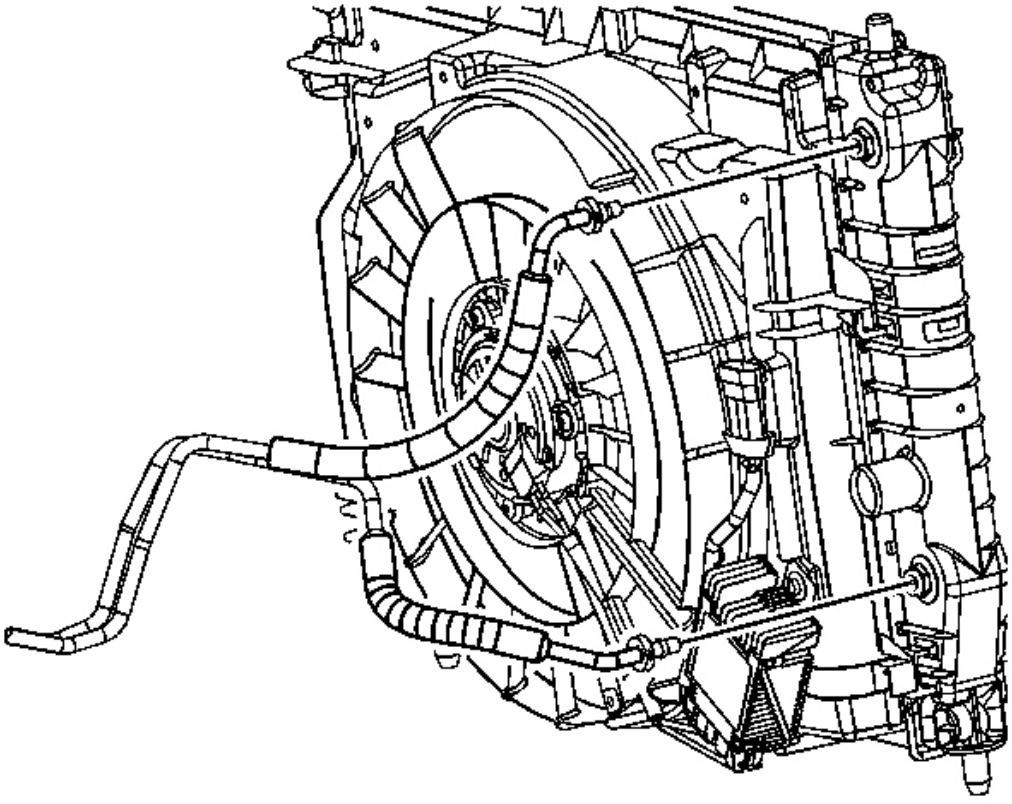


Fig. 88: Upper & Lower Transmission Oil Cooler Lines At Radiator
Courtesy of GENERAL MOTORS CORP.

1. Install the front transmission oil cooler lines to the vehicle.
2. Connect the upper transmission oil cooler line to the radiator. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
3. Connect the lower transmission oil cooler line to the radiator. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

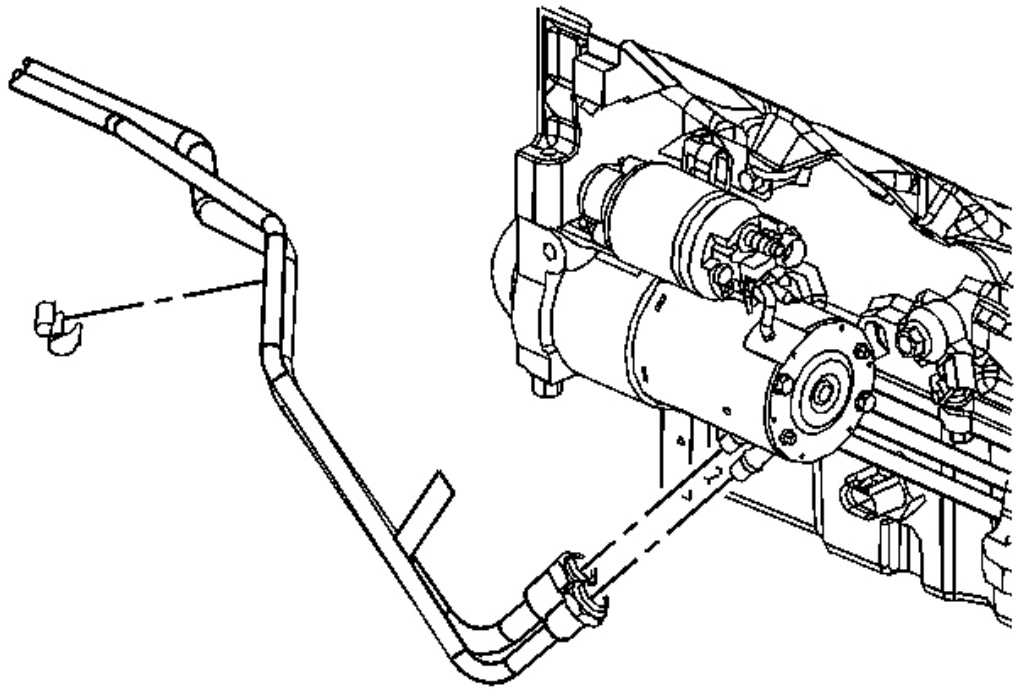


Fig. 89: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

4. Connect the upper transmission oil cooler line to the upper intermediate line. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
5. Connect the lower transmission oil cooler line to the lower intermediate line. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
6. Remove the drain pan from under the vehicle.

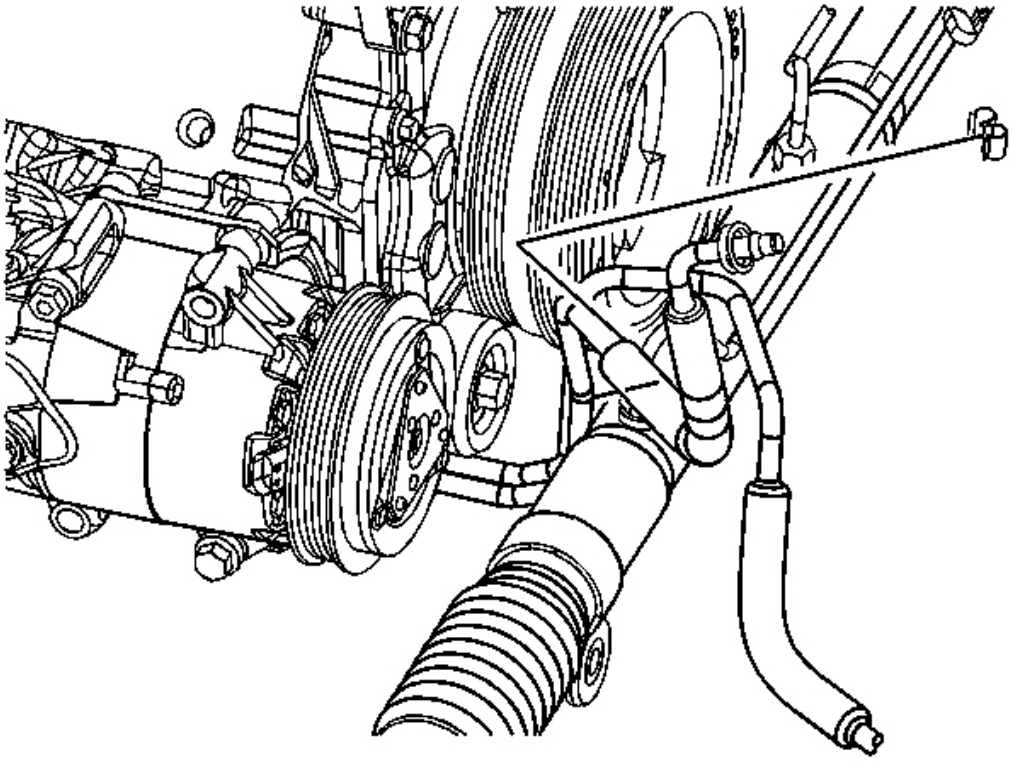


Fig. 90: Upper & Lower Transmission Line Front Clip
Courtesy of GENERAL MOTORS CORP.

7. Install the clip holding the front upper and lower transmission lines.
8. Install the engine mount. Refer to **Engine Mount Replacement - Right Side** for the 6.0L engine or **Engine Mount Replacement - Right Side** for the 7.0L engine.

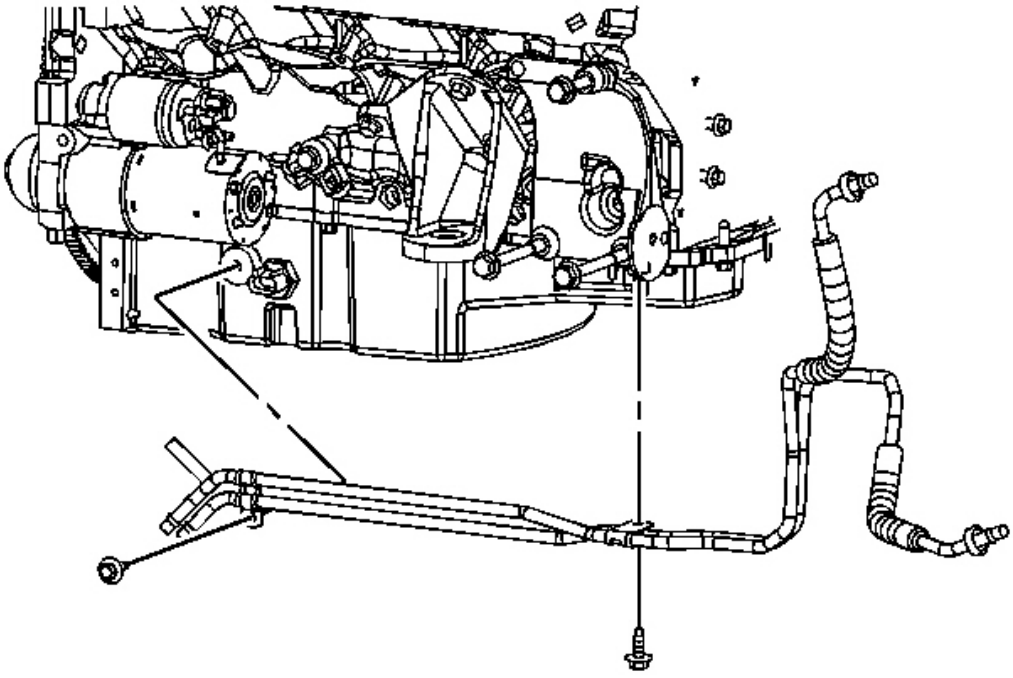


Fig. 91: Transmission Oil Cooler Lines & Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

9. Install the front transmission oil cooler line bolts.

   Tighten: Tighten the bolts to 12 N.m (106 lb in).

10. Inspect the transmission fluid level, add if necessary. Refer to **Transmission Fluid Level Inspection**.

TRANSMISSION FLUID COOLER HOSE/PIPE QUICK-CONNECT FITTING REPLACEMENT

Tools Required

- **J 41623-B** Cooler Quick Connect Tool
- **DT-47624** Transmission Cooler Line Release Tool. See **Special Tools**.

- **DT-47731** 1/2 Inch Quick Connect Release Tool

Removal Procedure

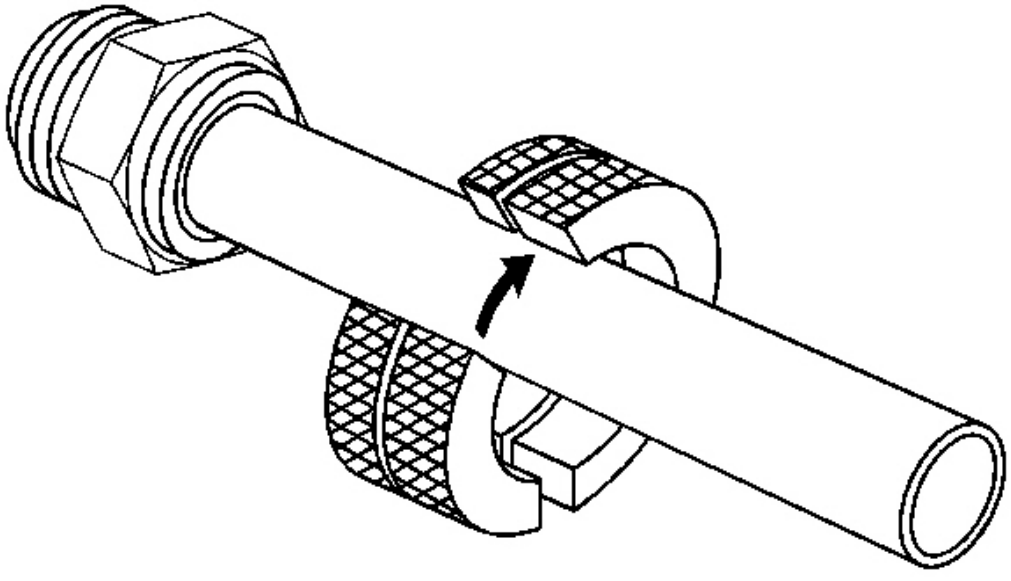


Fig. 92: View Of J 41623-B & Generator Cooling Inlet Pipe
Courtesy of GENERAL MOTORS CORP.

1. Install the **J 41623-B** , or the **DT-47731** or the **DT-47624** onto the transmission oil cooler (TOC) pipe. See **Special Tools**.

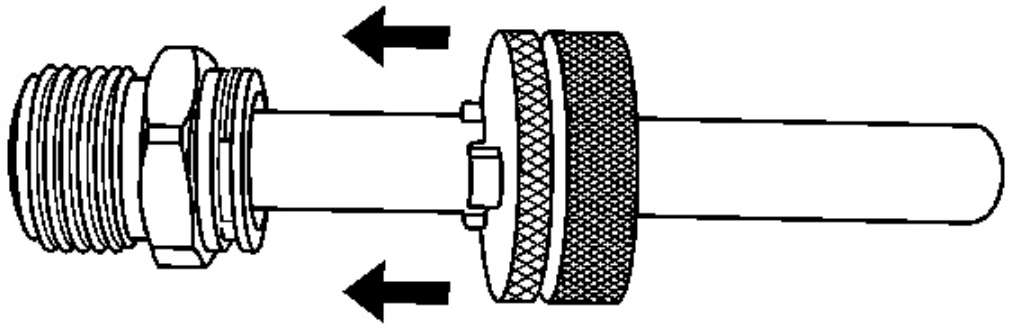


Fig. 93: Sliding J 41623-B Toward Generator Cooling Inlet Pipe Fitting
Courtesy of GENERAL MOTORS CORP.

2. Slide the **J 41623-B** , or the **DT-47731** or the **DT-47624** toward the TOC pipe fitting. See **Special Tools**.

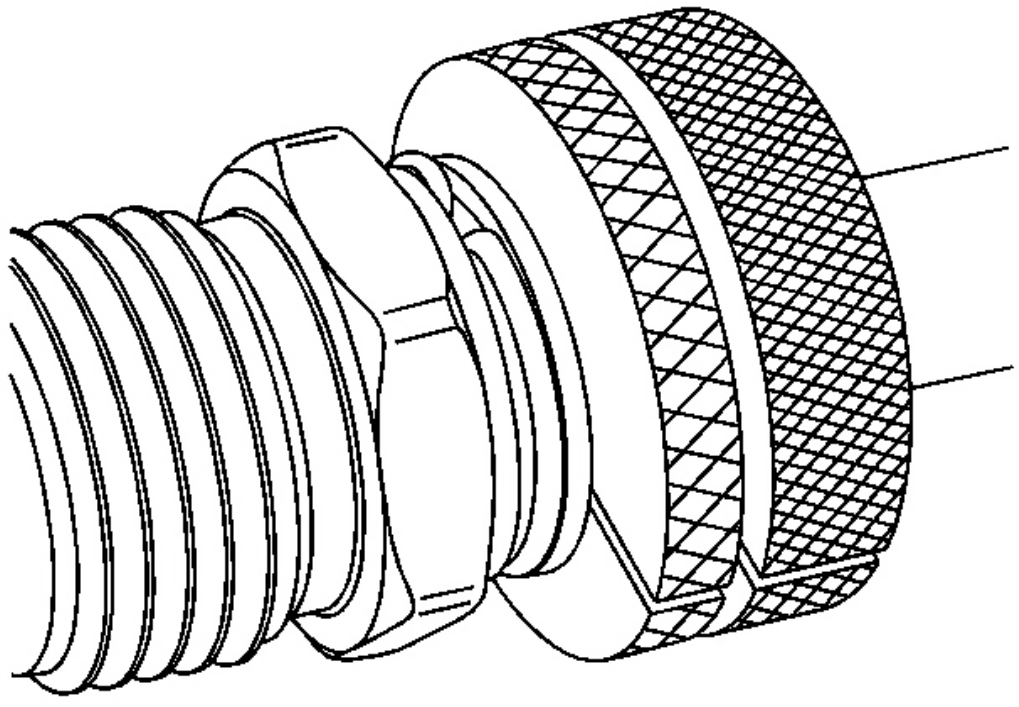


Fig. 94: Rotating J 41623-B On Coolant Pipe
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Rotate the J 41623-B , or the DT-47731 or the DT-47624 to engage the TOC pipe fitting's retainer slots. See Special Tools.
The J 41623-B , or the DT-47731 or the DT-47624 should be nearly flush with the fitting. See Special Tools.

3. Connect the **J 41623-B** , or the **DT-47731** or the **DT-47624** onto the TOC pipe fitting. See **Special Tools**.

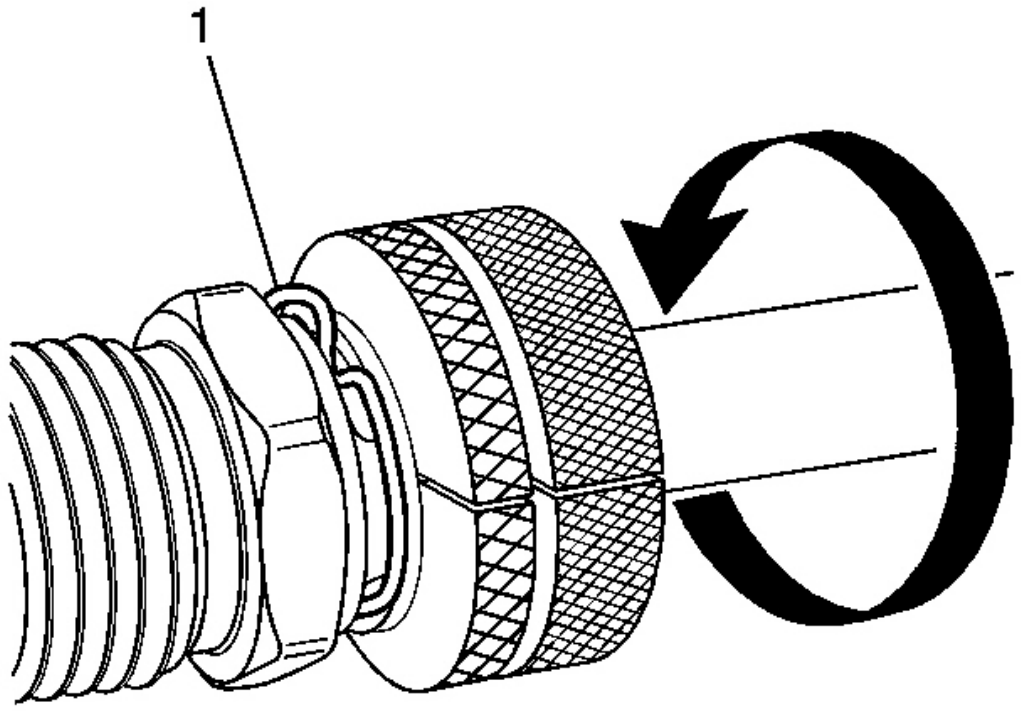


Fig. 95: Rotating J 41623-B Until Retainer Clip Rises Above Fitting Retainer Seat
Courtesy of GENERAL MOTORS CORP.

4. Rotate the **J 41623-B** , or the **DT-47731** or the **DT-47624** until the retainer clip (1) rises above the fitting retainer seat. See **Special Tools**.

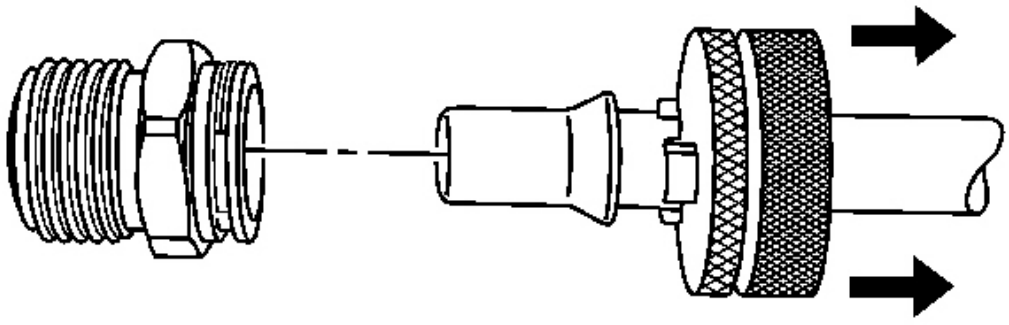


Fig. 96: View Of J 41623-B & Generator Cooling Inlet Pipe
Courtesy of GENERAL MOTORS CORP.

5. Pull back on the TOC pipe to disengage the pipe from the TOC pipe fitting.
6. Remove the **J 41623-B** , or the **DT-47731** or the **DT-47624** from the TOC pipe. See **Special Tools**.

Installation Procedure

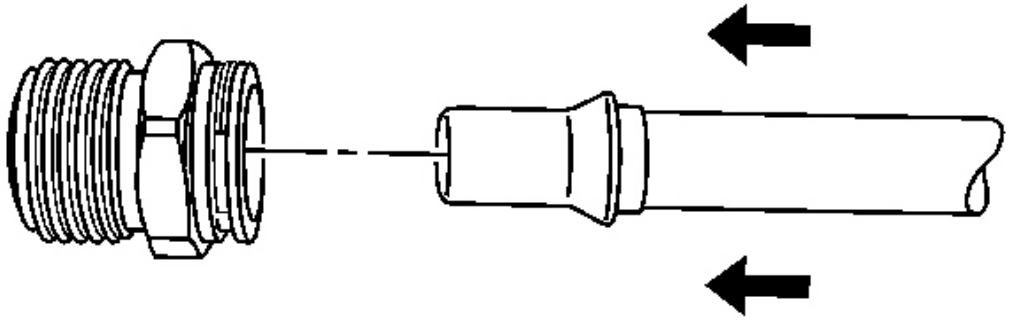


Fig. 97: View Of Generator Cooling Inlet Pipe & Generator Cooling Inlet Pipe Fitting
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Inspect the TOC pipe fitting and retaining clip for signs of wear or damage. Replace the components if necessary.

1. Install the TOC pipe into the TOC pipe fitting.

   A distinct snap should be heard or felt when assembling the TOC pipe to the fitting.

2. To ensure the cooler line is properly installed, give the cooler pipe a gentle pull.

TRANSMISSION FLUID COOLER UPPER PIPE REPLACEMENT - REAR

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** in Propeller Shaft.
3. Install a drain pan under the vehicle.

IMPORTANT:

- **The front transmission fluid cooler pipes connect to the rear transmission fluid cooler pipes near at the rear of the engine next to the starter motor.**
- **Cap or plug the open transmission fluid cooler pipes immediately to prevent system contamination.**

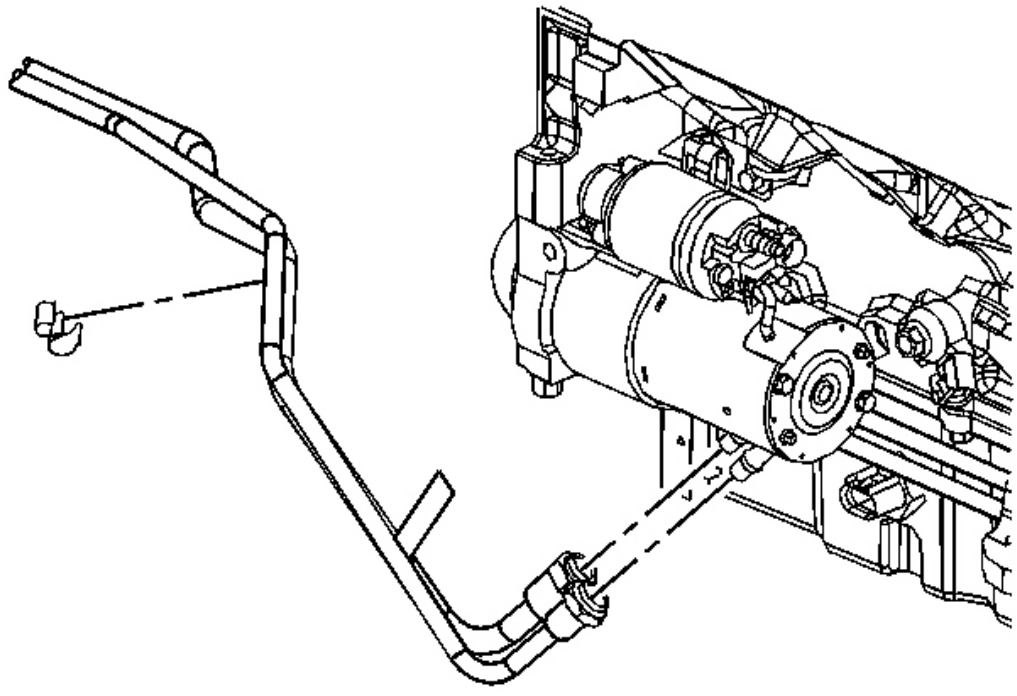


Fig. 98: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the rear transmission fluid cooler upper pipe from the front transmission fluid cooler upper pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

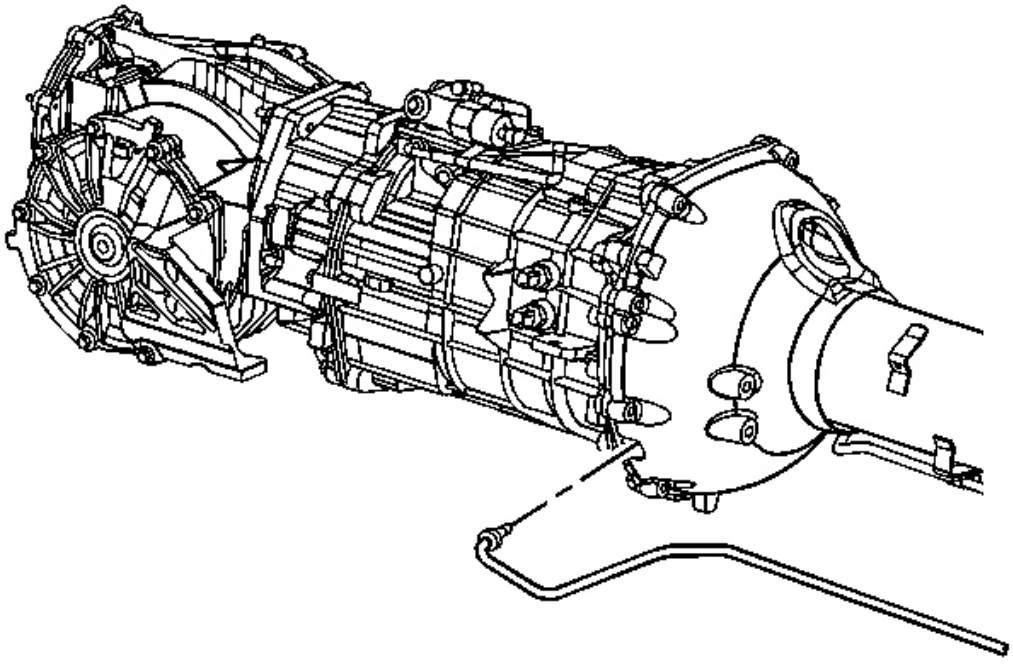


Fig. 99: Transmission Fluid Cooler Upper Pipe At Transmission
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the rear transmission fluid cooler upper pipe from the transmission. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

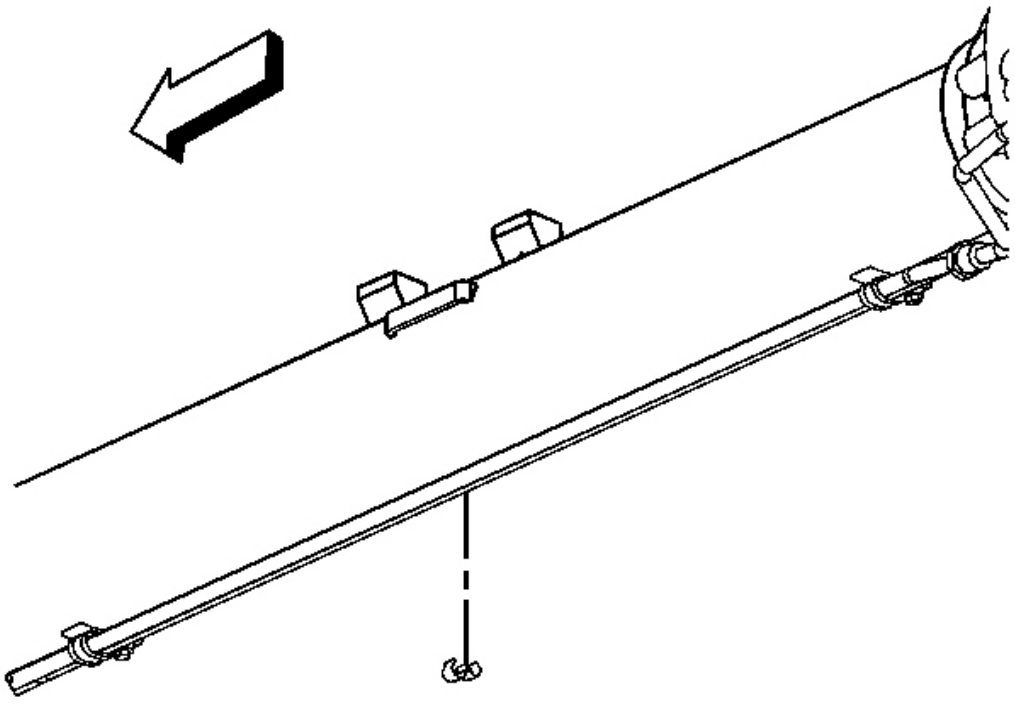


Fig. 100: Transmission Fluid Cooler Pipes & Clip
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission fluid cooler pipes clip.

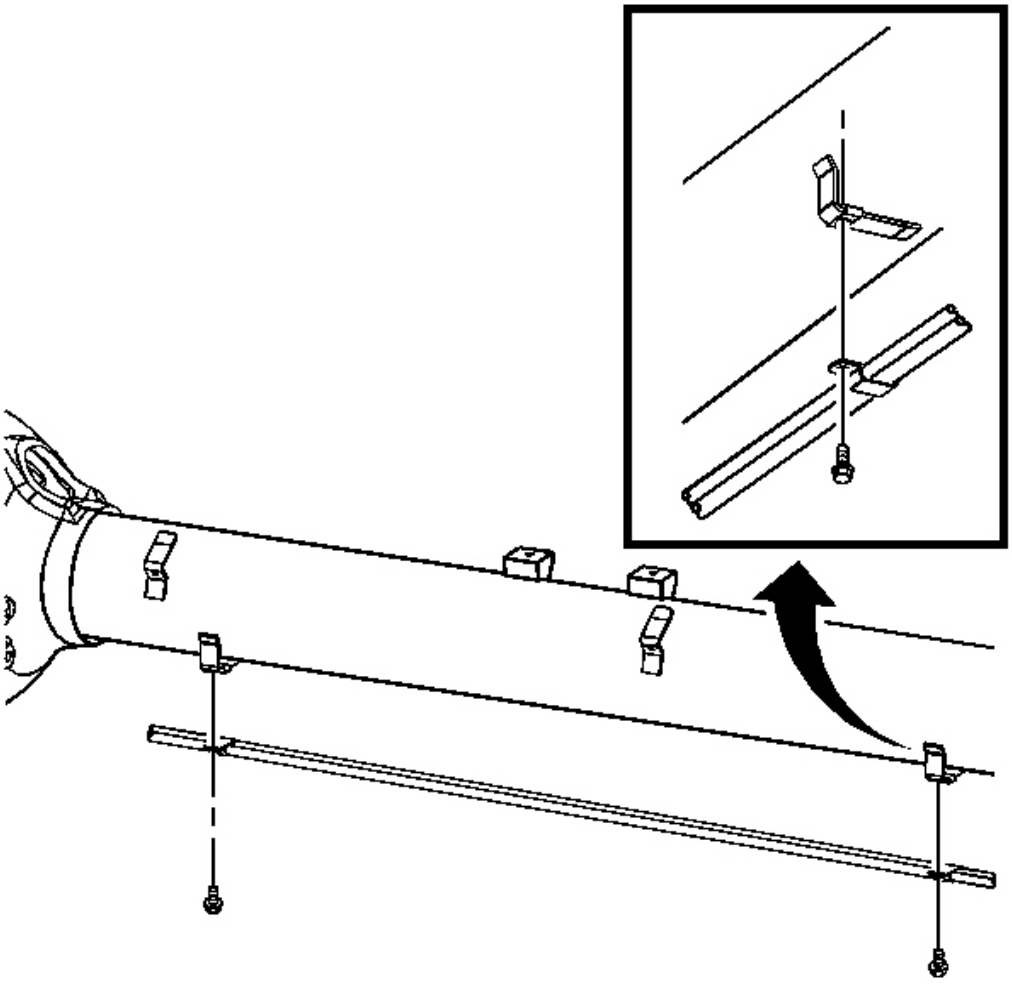


Fig. 101: Transmission Fluid Cooler Upper Pipe Retaining Bolts At Driveline Support
Courtesy of GENERAL MOTORS CORP.

7. Remove the rear transmission fluid cooler upper pipe retaining bolts from the driveline support.

IMPORTANT: Spread the clamps holding the two pipes together to remove the pipe from the vehicle.

8. Disconnect the rear transmission fluid cooler upper pipe from the vehicle.

Installation Procedure

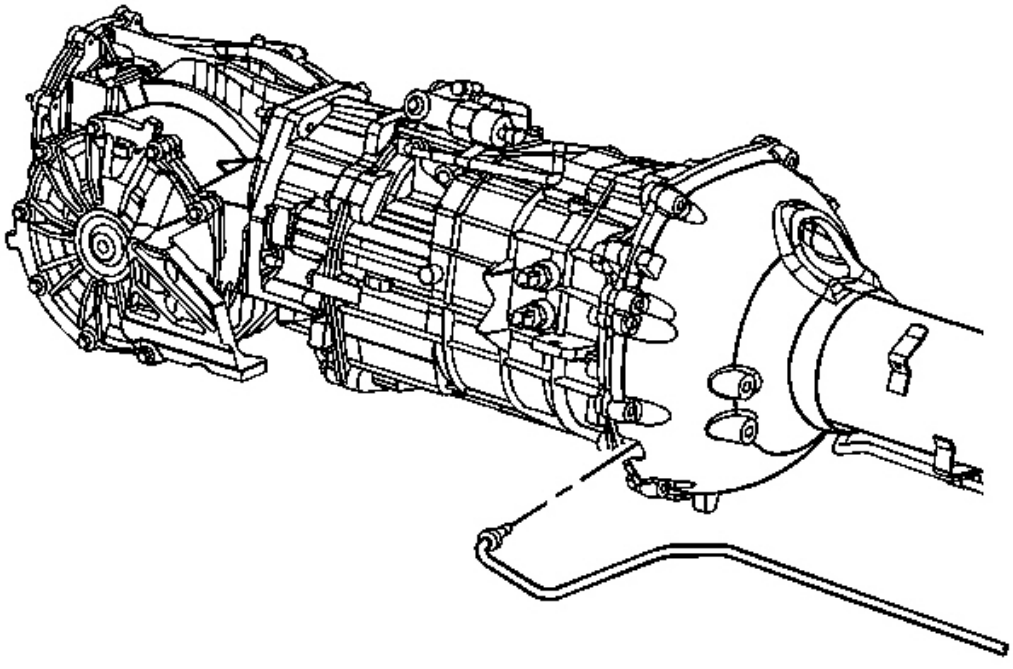


Fig. 102: Transmission Fluid Cooler Upper Pipe At Transmission
Courtesy of GENERAL MOTORS CORP.

1. Connect the rear transmission fluid cooler upper pipe to the transmission. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

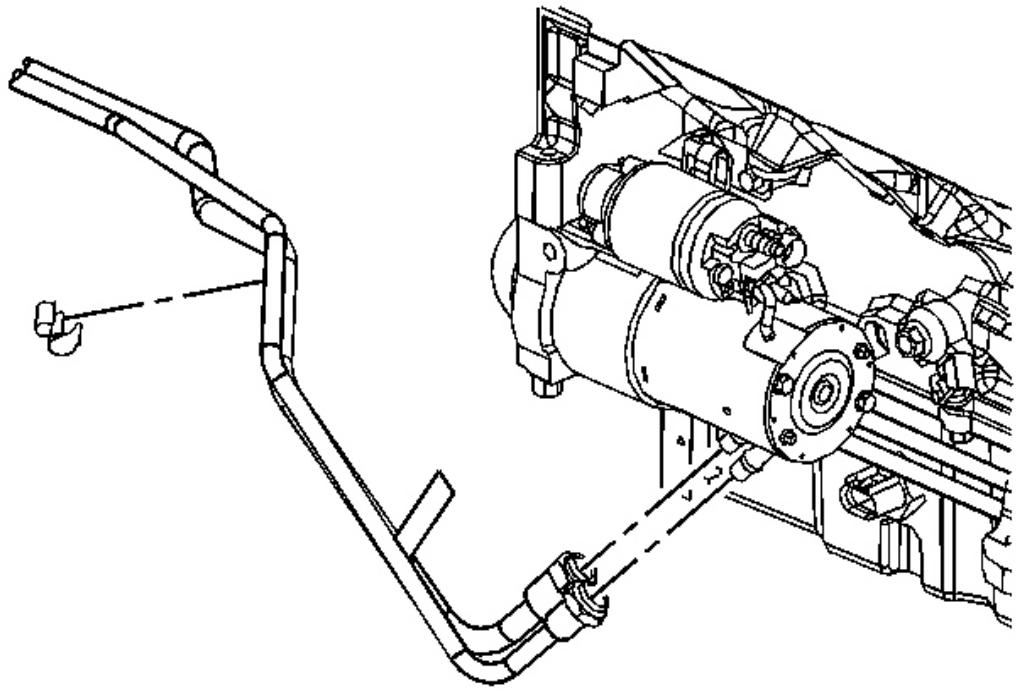


Fig. 103: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

2. Connect the rear transmission fluid cooler upper pipe to the front transmission fluid cooler upper pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

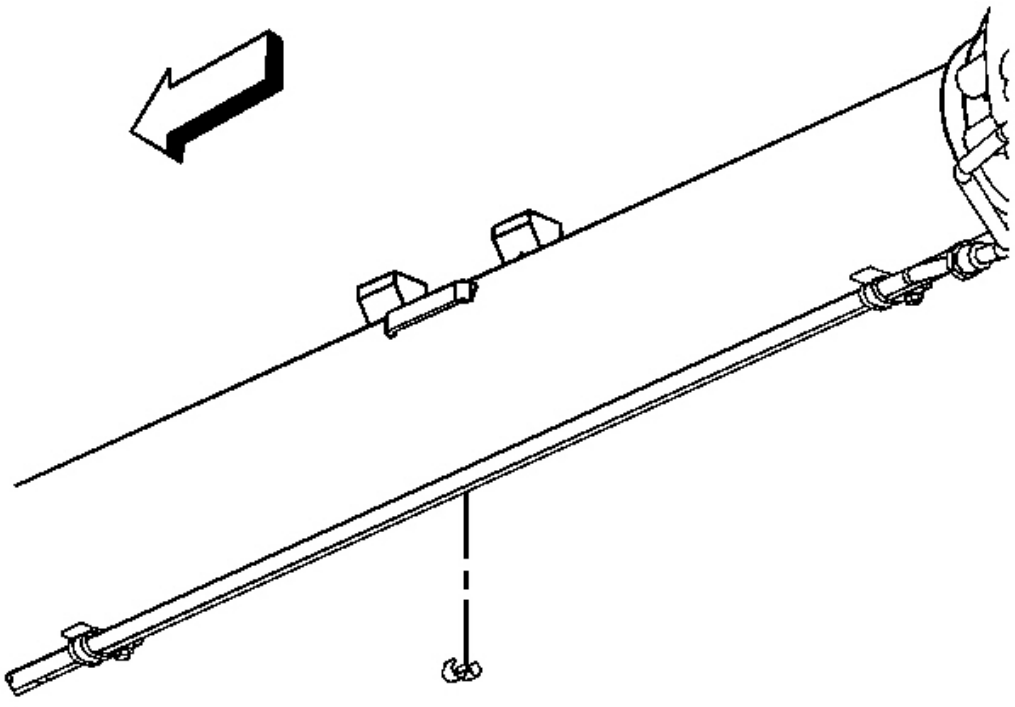


Fig. 104: Transmission Fluid Cooler Pipes & Clip
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission fluid cooler pipes clip.

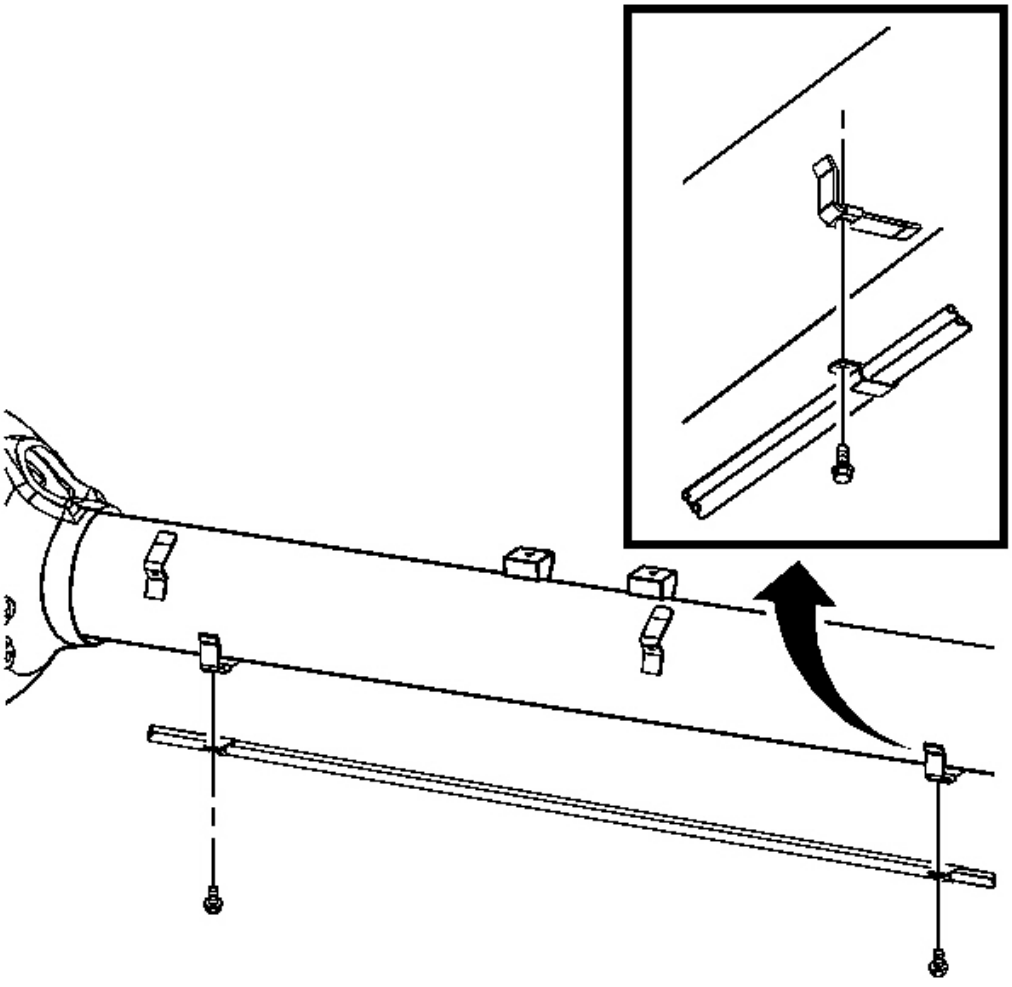


Fig. 105: Transmission Fluid Cooler Upper Pipe Retaining Bolts At Driveline Support
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the rear transmission fluid cooler upper pipe retaining bolts to the driveline support.

   Tighten: Tighten the bolt to 12 N.m (9 lb ft).

5. Check the transmission fluid level, add fluid if necessary. Refer to **Transmission Fluid**

Level Inspection.

6. Remove the drain pan.
7. Remove the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** in Propeller Shaft.
8. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

TRANSMISSION FLUID COOLER UPPER PIPE REPLACEMENT - REAR - TO DIFFE DIFFERENTIAL COOLER

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Lower and support the rear of the exhaust.
3. Install a drain pan under the vehicle.

IMPORTANT: Cap or plug the open transmission fluid cooler pipes immediately to prevent system contamination.

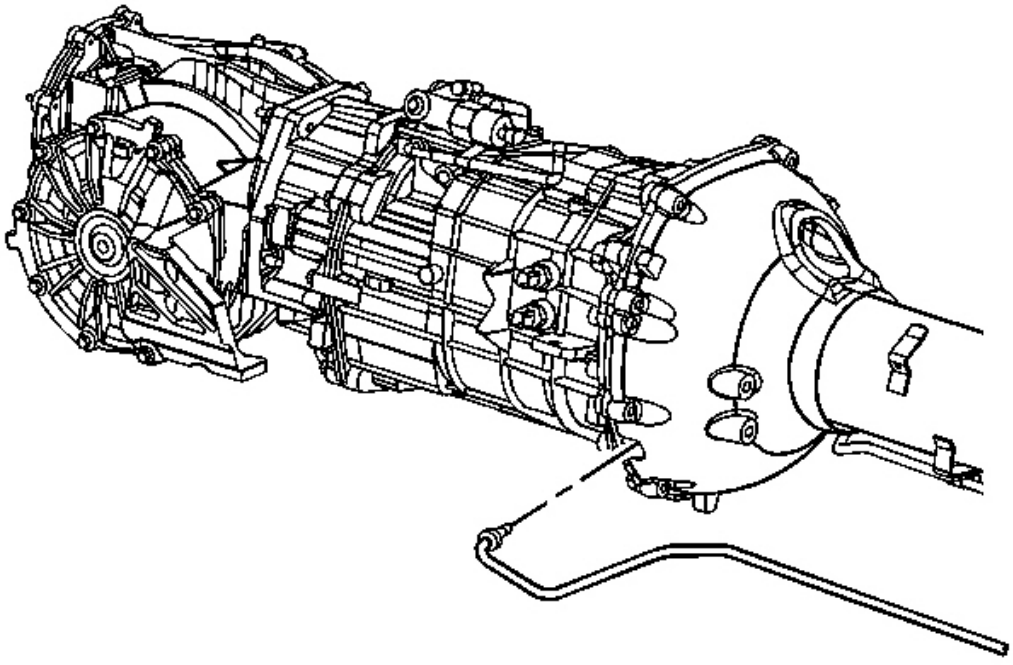


Fig. 106: Transmission Fluid Cooler Upper Pipe At Transmission
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the rear transmission fluid cooler upper pipe from the transmission. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

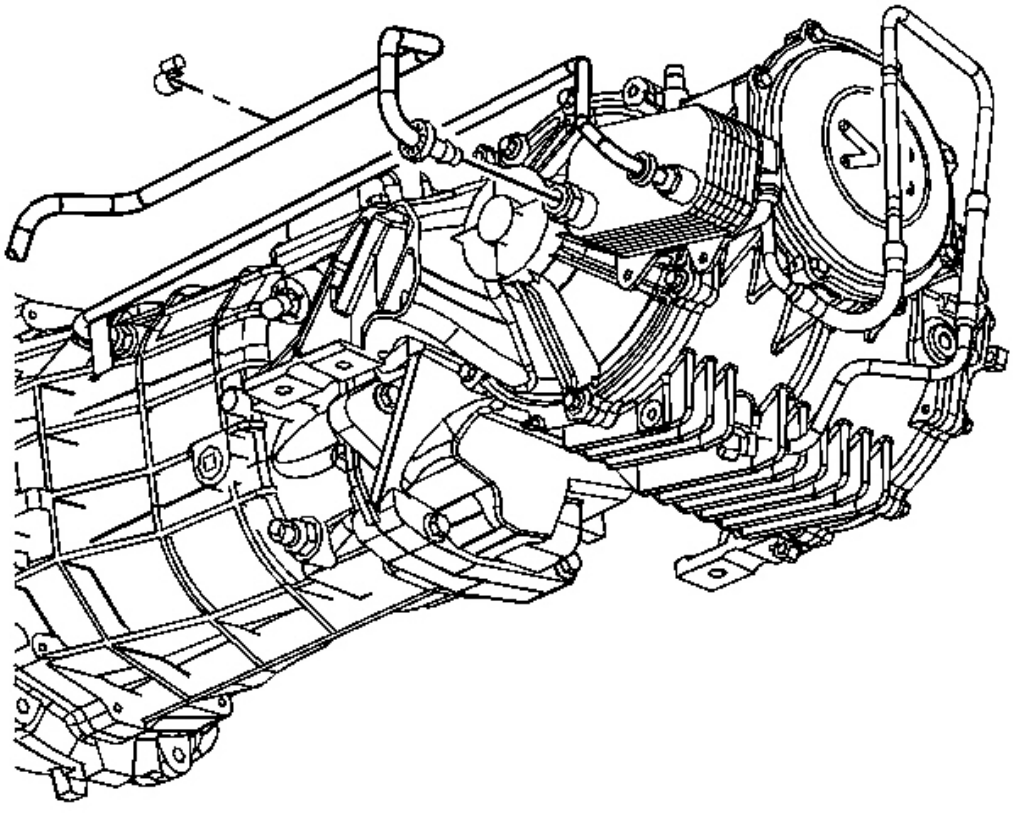


Fig. 107: Transmission Fluid Cooler Pipes Clip
Courtesy of GENERAL MOTORS CORP.

5. Remove the transmission fluid cooler pipes clip.
6. Disconnect the rear transmission fluid cooler upper pipe from the Differential oil cooler. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
7. Remove the rear to differential cooler transmission fluid cooler upper pipe from the vehicle.

Installation Procedure

1. Install the rear to differential cooler transmission fluid cooler upper pipe to the vehicle.

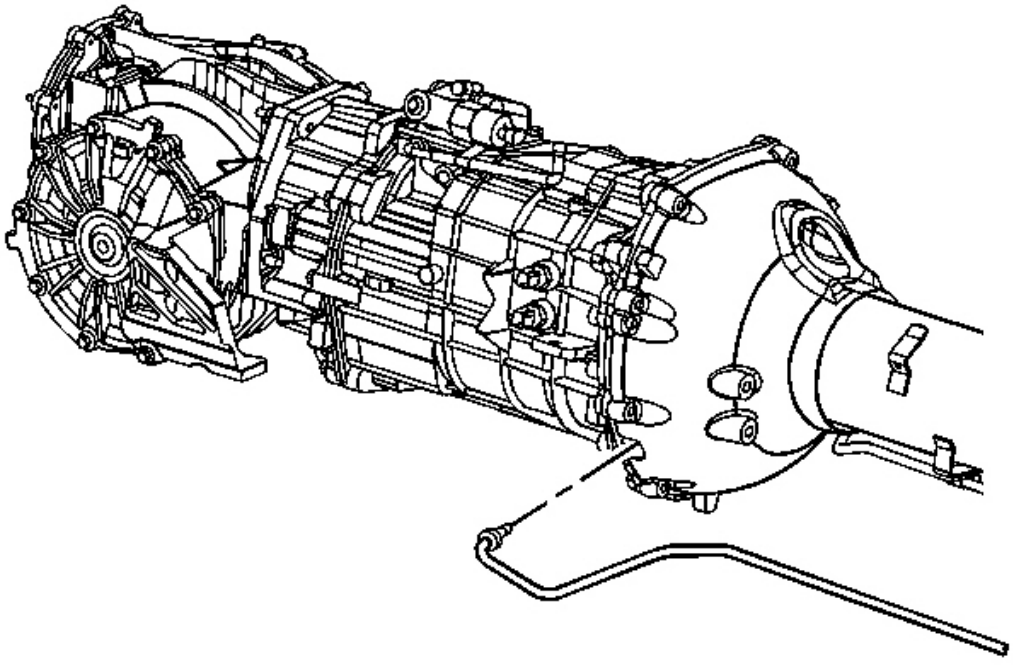


Fig. 108: Transmission Fluid Cooler Upper Pipe At Transmission
Courtesy of GENERAL MOTORS CORP.

2. Connect the rear transmission fluid cooler upper pipe to the transmission. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

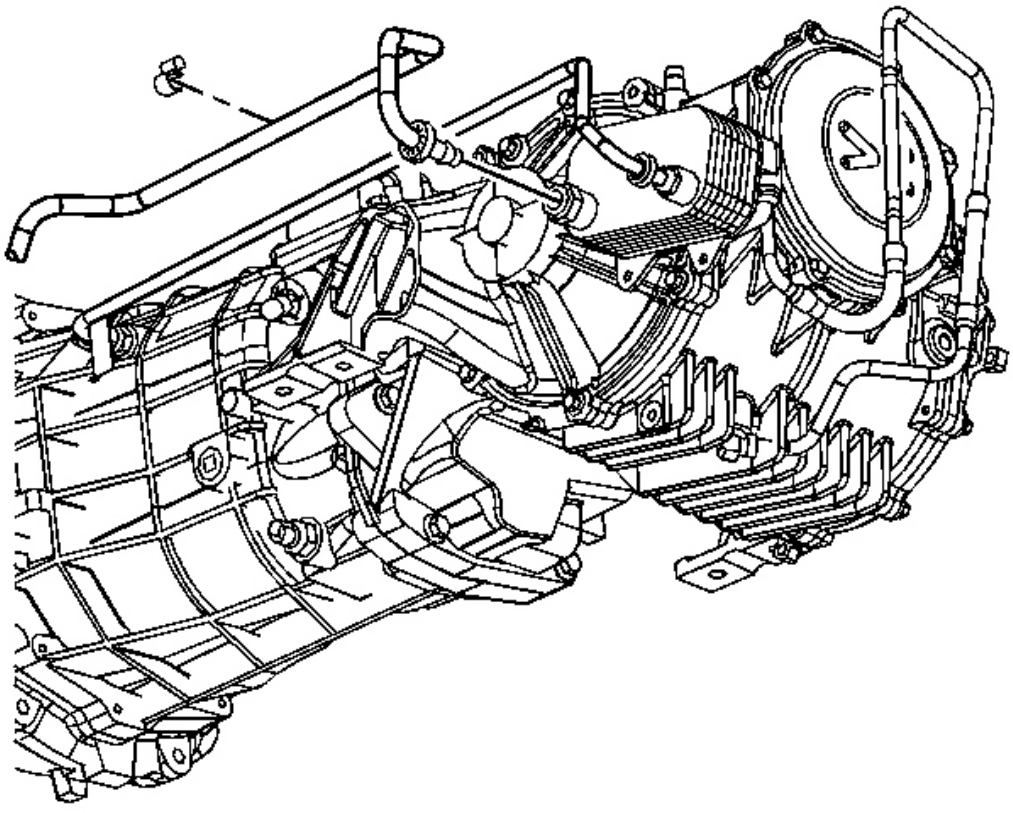


Fig. 109: Transmission Fluid Cooler Pipes Clip
Courtesy of GENERAL MOTORS CORP.

3. Connect the rear transmission fluid cooler upper pipe to the Differential oil cooler. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
4. Install the transmission fluid cooler pipes clip.
5. Check the transmission fluid level, add fluid if necessary. Refer to **Transmission Fluid Level Inspection**.
6. Raise and secure the rear of the exhaust.
7. Remove the drain pan.
8. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

TRANSMISSION FLUID COOLER LOWER PIPE REPLACEMENT - INTERMEDIATE

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** in Propeller Shaft.
3. Install a drain pan under the vehicle.

IMPORTANT:

- **The front transmission fluid cooler pipes connect to the rear transmission fluid cooler pipes near at the rear of the engine next to the starter motor.**
- **Cap or plug the open transmission fluid cooler pipes immediately to prevent system contamination.**

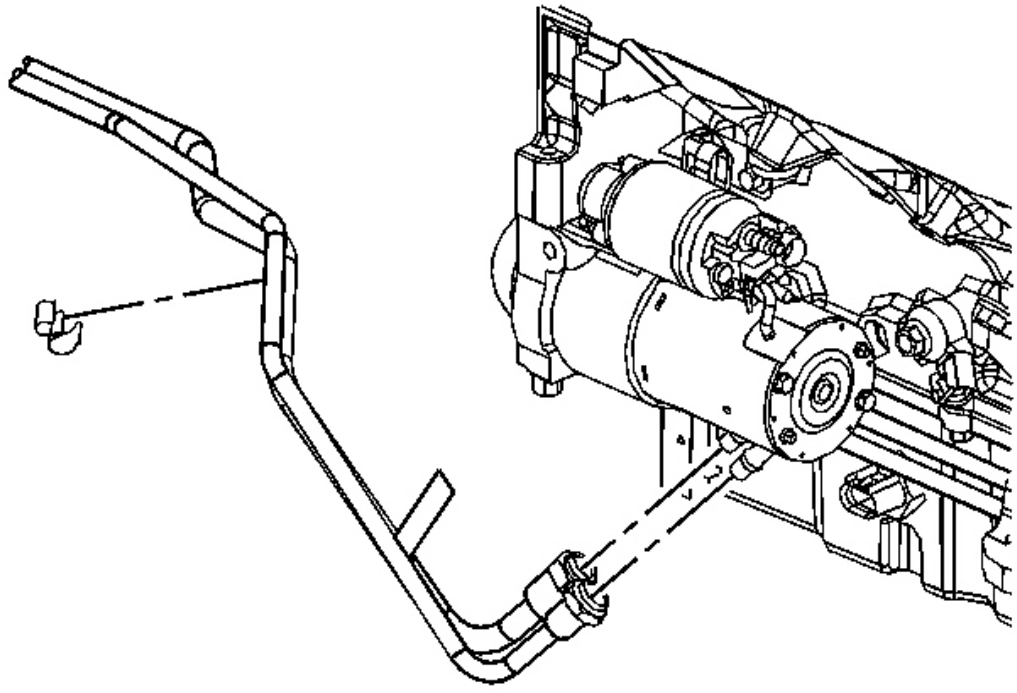


Fig. 110: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the intermediate transmission fluid cooler lower pipe from the front transmission fluid cooler lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

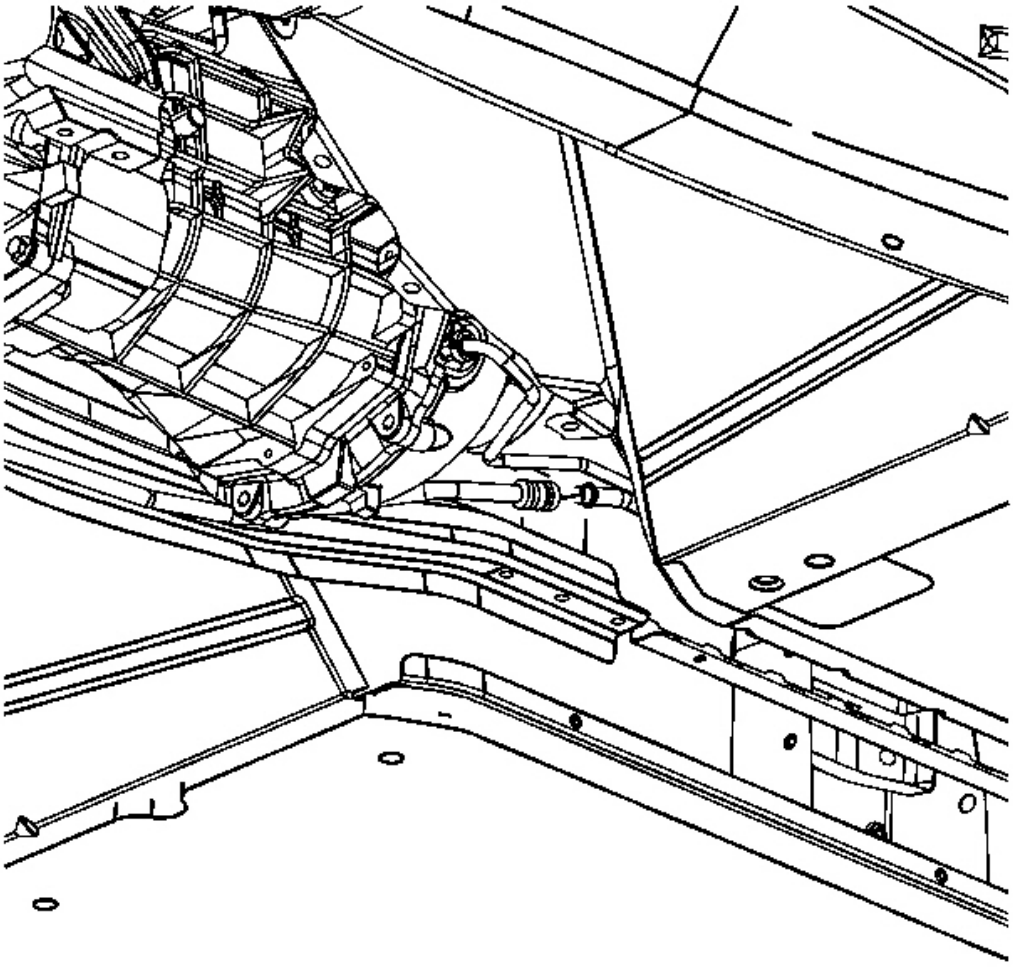


Fig. 111: View Of Intermediate Transmission Fluid Cooler Lower Pipe At Rear Transmission Lower Pipe
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the intermediate transmission fluid cooler lower pipe from the rear transmission lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

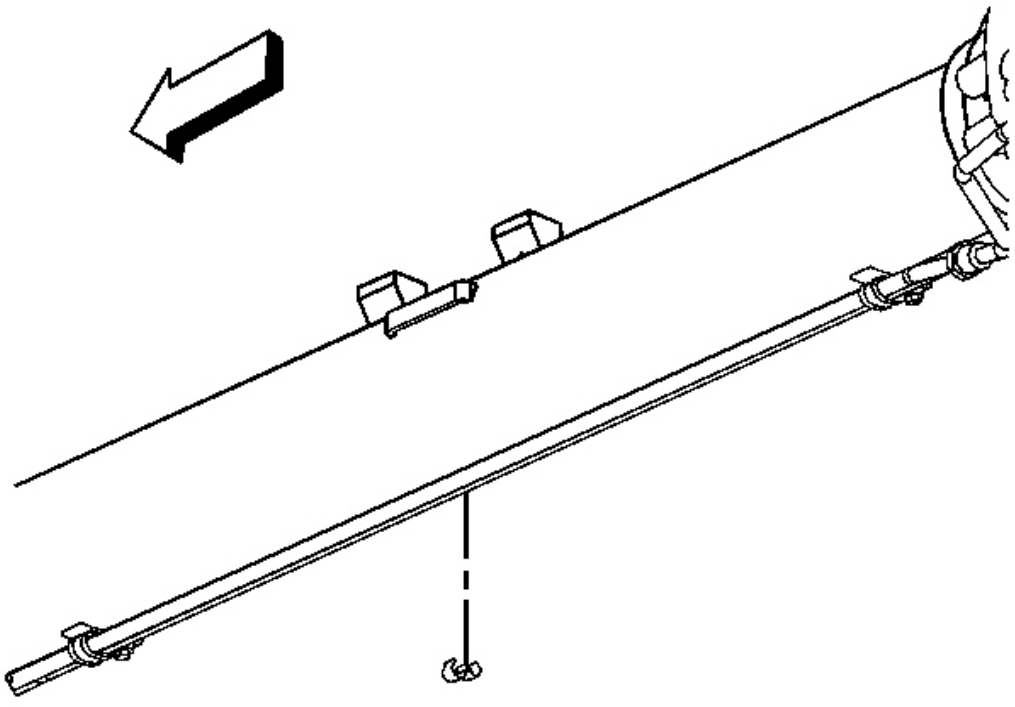


Fig. 112: Transmission Fluid Cooler Pipes & Clip
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission fluid cooler pipes clip.

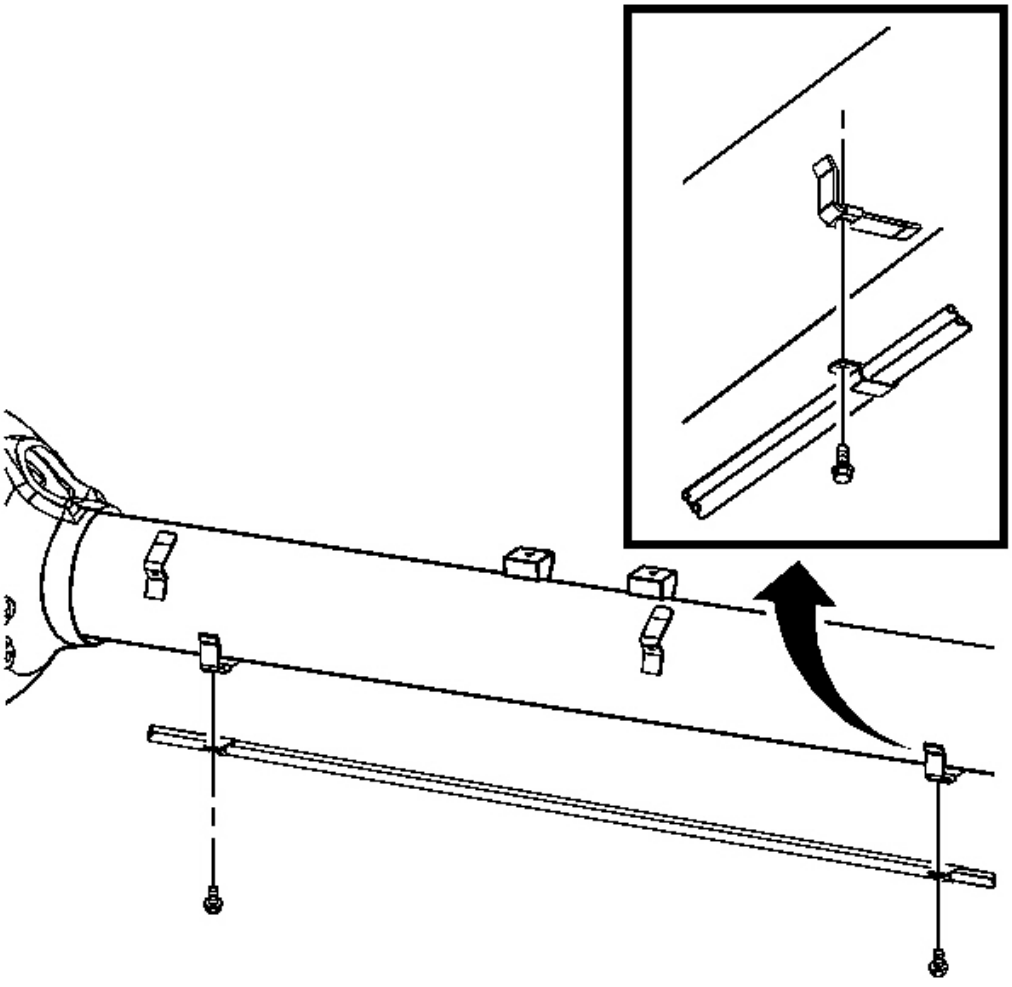


Fig. 113: Transmission Fluid Cooler Upper Pipe Retaining Bolts At Driveline Support
Courtesy of GENERAL MOTORS CORP.

7. Remove the transmission fluid cooler pipe retaining bolts from the driveline support.

IMPORTANT: Spread the clamps holding the two pipes together to remove the pipe from the vehicle.

8. Remove the intermediate transmission fluid cooler lower pipe from the vehicle.

Installation Procedure

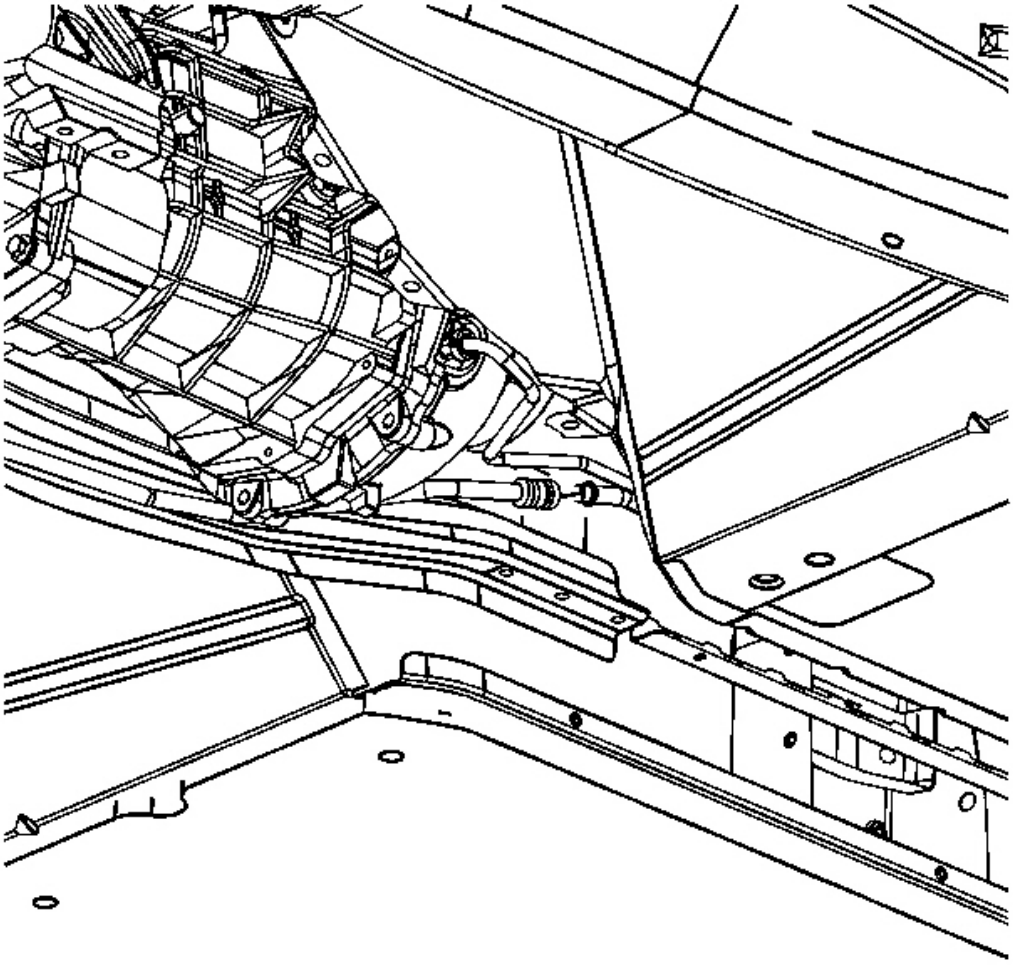


Fig. 114: View Of Intermediate Transmission Fluid Cooler Lower Pipe At Rear Transmission Lower Pipe
Courtesy of GENERAL MOTORS CORP.

1. Connect the intermediate transmission fluid cooler lower pipe to the rear transmission lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

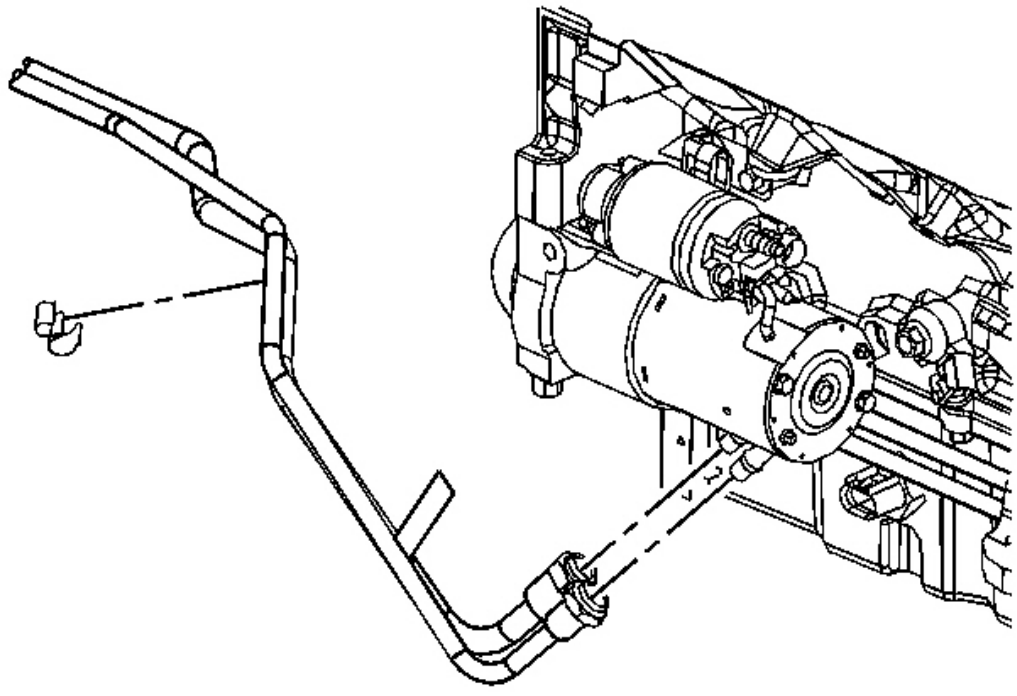


Fig. 115: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

2. Connect the intermediate transmission fluid cooler lower pipe to the front transmission fluid cooler lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

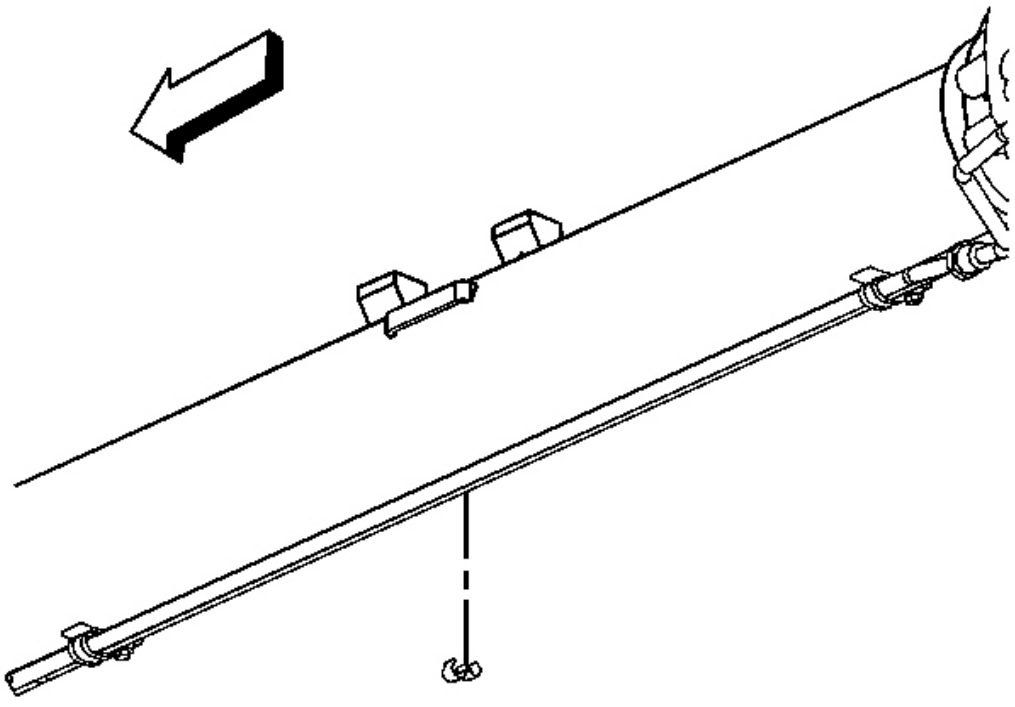


Fig. 116: Transmission Fluid Cooler Pipes & Clip
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission fluid cooler pipes clip.

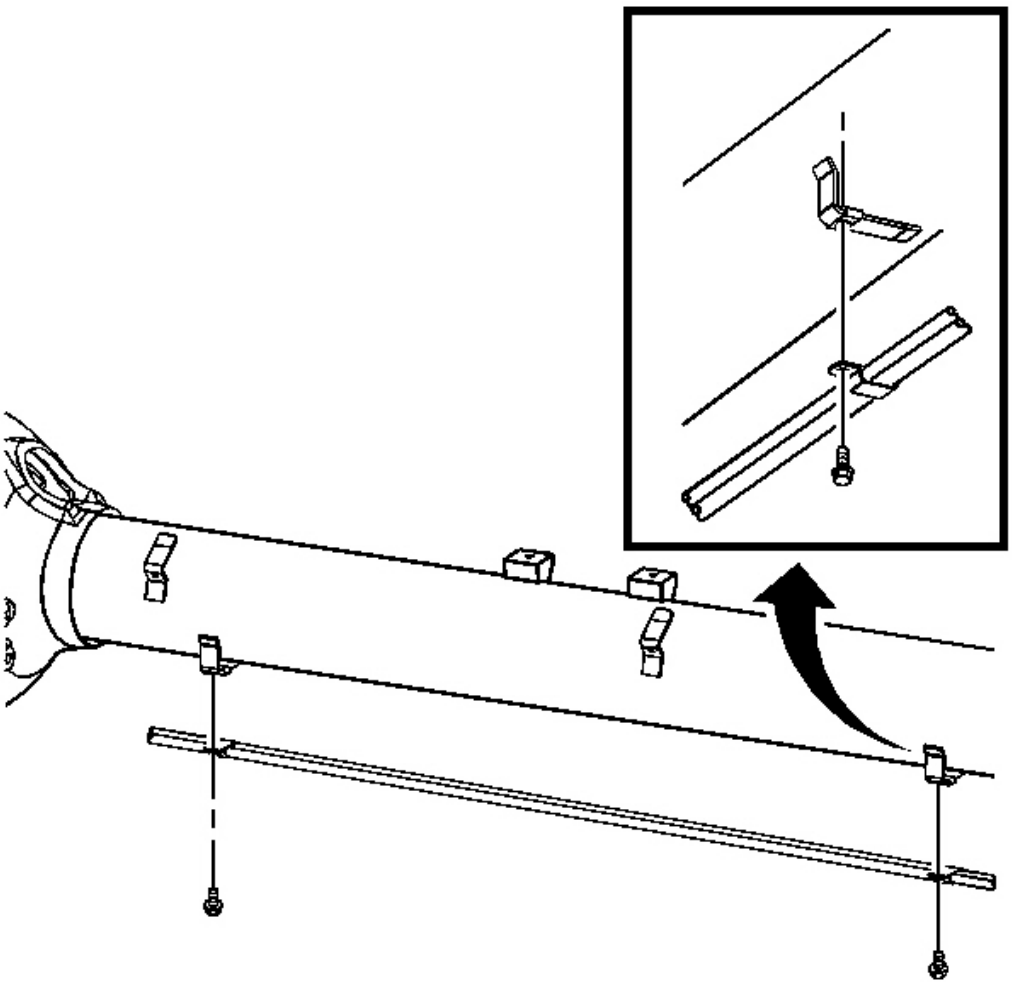


Fig. 117: Transmission Fluid Cooler Upper Pipe Retaining Bolts At Driveline Support
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the transmission fluid cooler pipe retaining bolts to the driveline support.

   Tighten: Tighten the bolt to 12 N.m (9 lb ft).

5. Check the transmission fluid level, add fluid if necessary. Refer to **Transmission Fluid**

Level Inspection.

6. Remove the drain pan.
7. Install the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** in Propeller Shaft.
8. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

TRANSMISSION FLUID COOLER LOWER PIPE REPLACEMENT - INTERMEDIATE TO TRANSMISSION

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** in Propeller Shaft.
3. Install a drain pan under the vehicle.

IMPORTANT:

- **The front transmission fluid cooler pipes connect to the rear transmission fluid cooler pipes near at the rear of the engine next to the starter motor.**
- **Cap or plug the open transmission fluid cooler pipes immediately to prevent system contamination.**

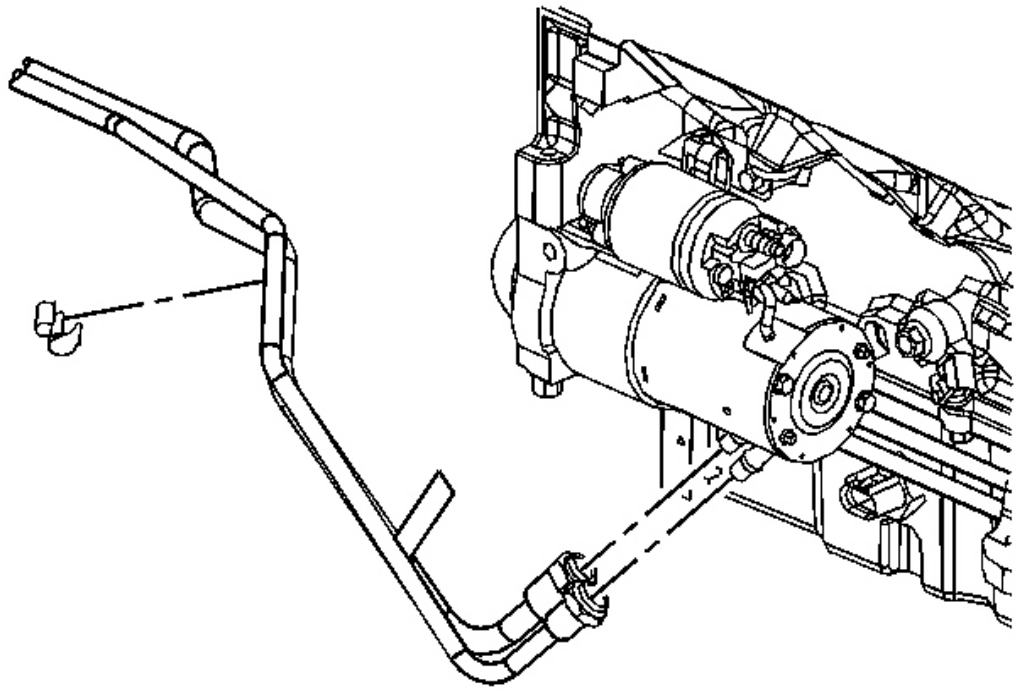


Fig. 118: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the intermediate transmission fluid cooler lower pipe from the front transmission fluid cooler lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
5. Disconnect the intermediate transmission fluid cooler lower pipe from the rear transmission lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

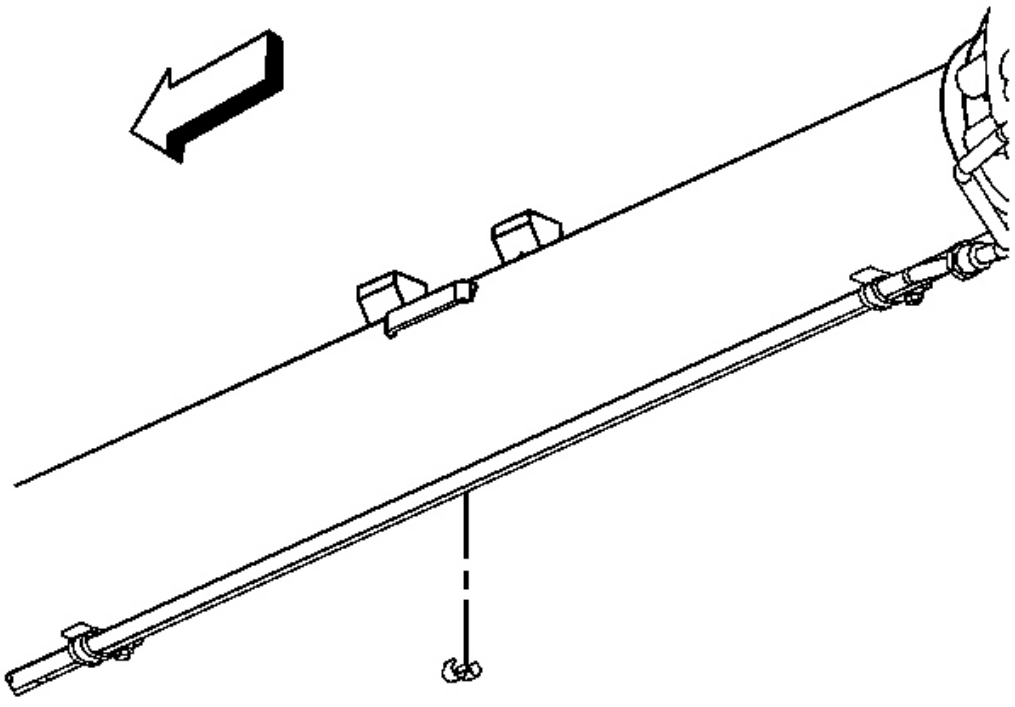


Fig. 119: Transmission Fluid Cooler Pipes & Clip
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission fluid cooler pipes clip.

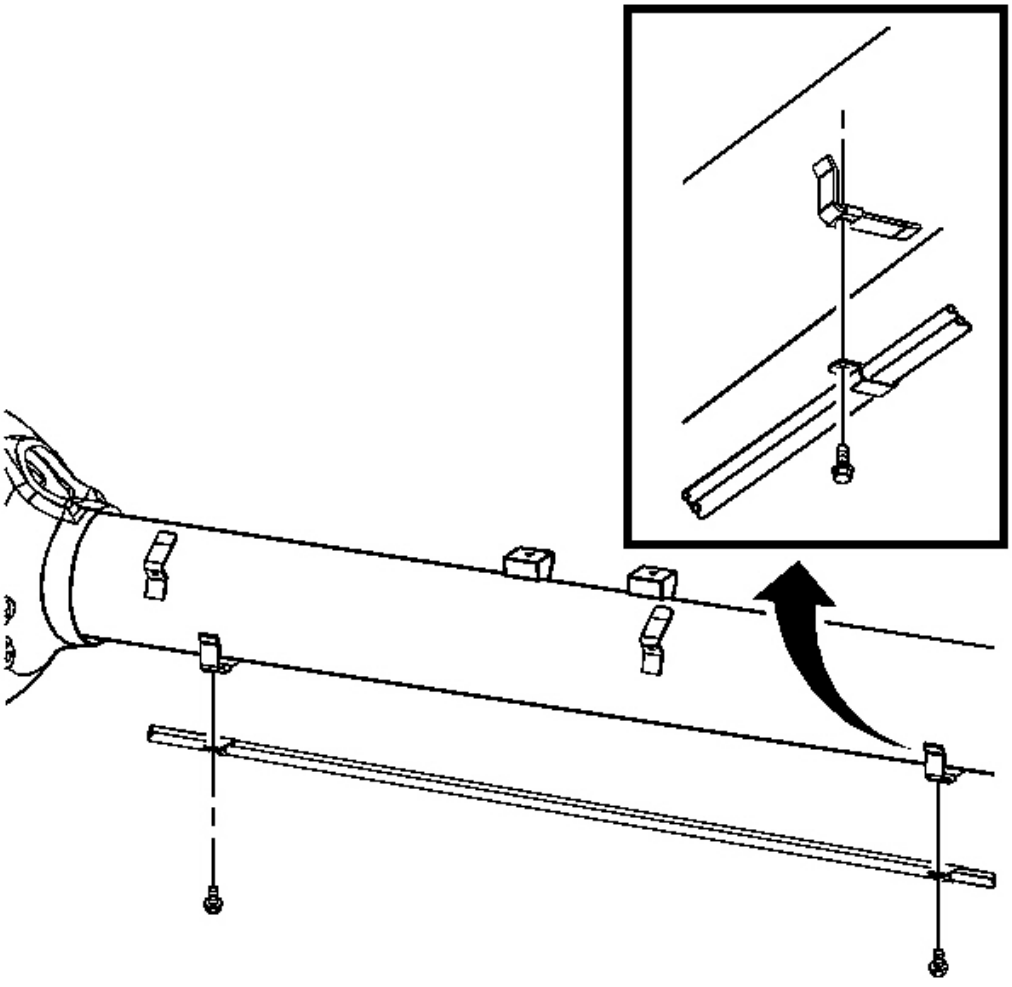


Fig. 120: Transmission Fluid Cooler Upper Pipe Retaining Bolts At Driveline Support
Courtesy of GENERAL MOTORS CORP.

7. Remove the transmission fluid cooler pipe retaining bolts from the driveline support.

IMPORTANT: Spread the clamps holding the two pipes together to remove the pipe from the vehicle.

8. Remove the intermediate transmission fluid cooler lower pipe from the vehicle.

Installation Procedure

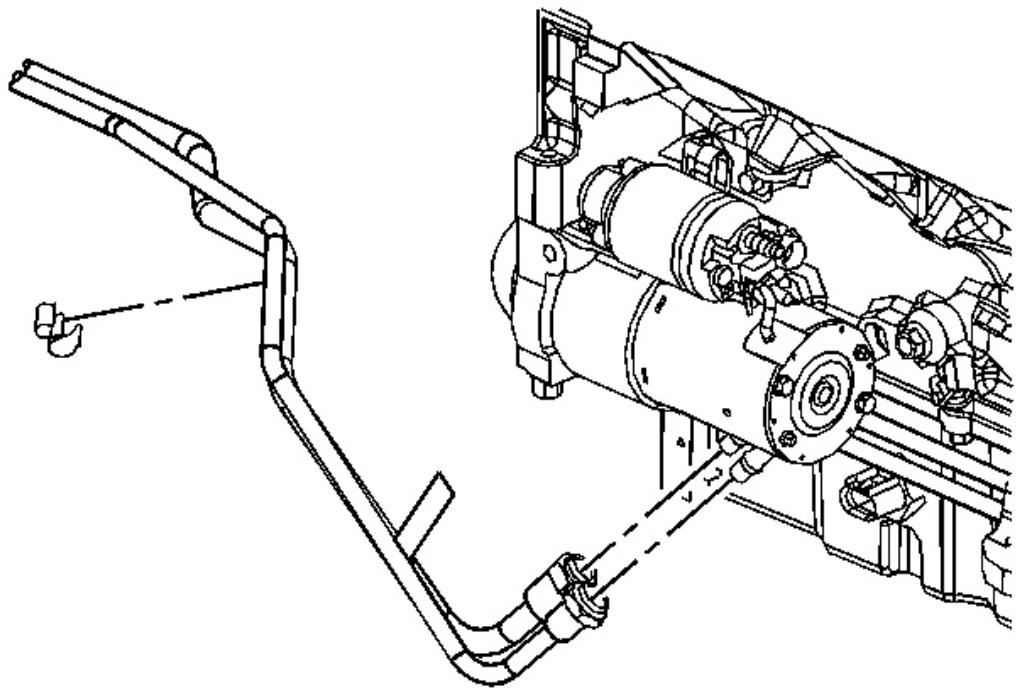


Fig. 121: Upper & Lower Transmission Oil Cooler Lines At Intermediate Lines
Courtesy of GENERAL MOTORS CORP.

1. Connect the intermediate transmission fluid cooler lower pipe to the rear transmission lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
2. Connect the intermediate transmission fluid cooler lower pipe to the front transmission fluid cooler lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

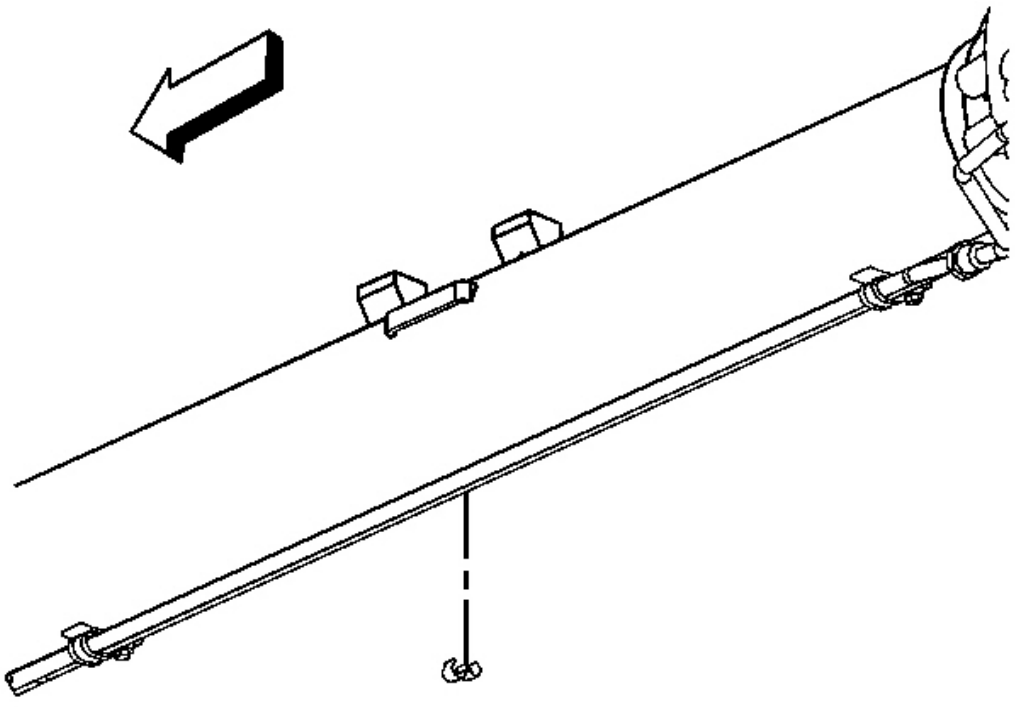


Fig. 122: Transmission Fluid Cooler Pipes & Clip
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission fluid cooler pipes clip.

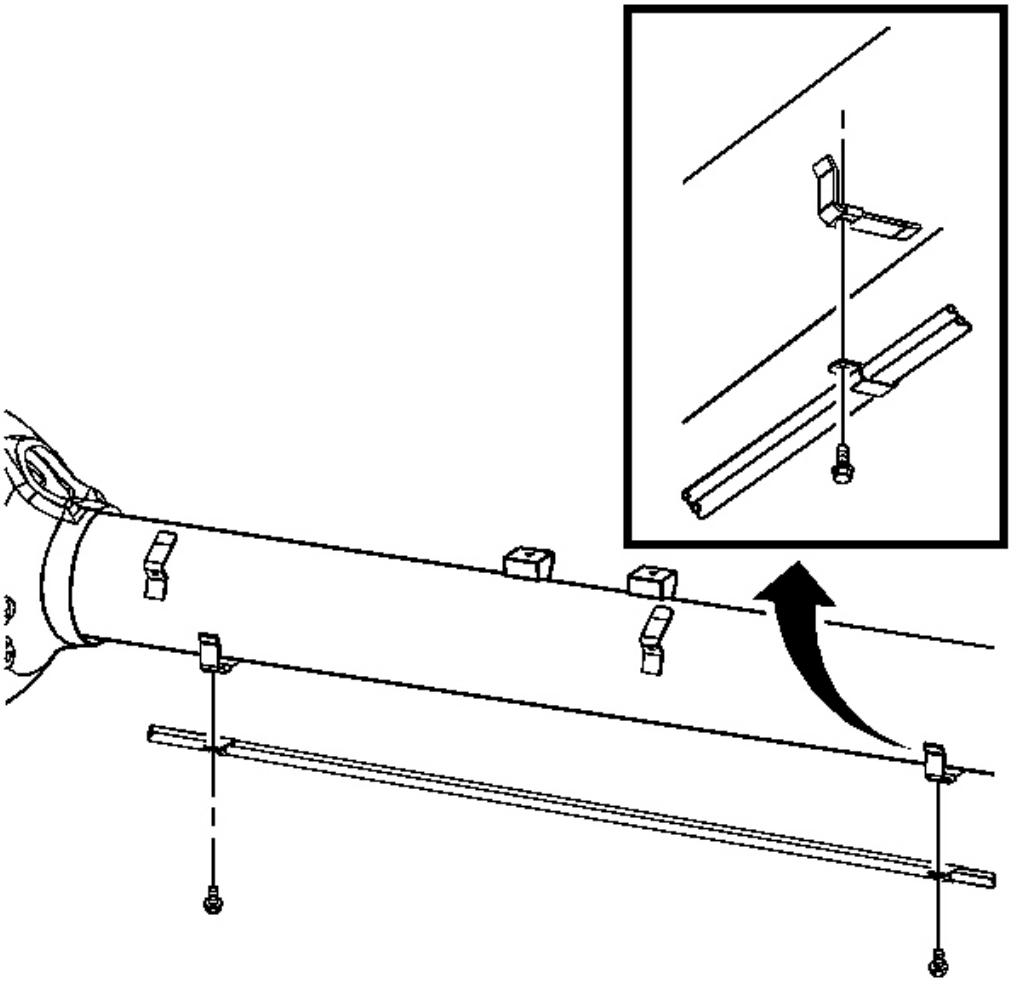


Fig. 123: Transmission Fluid Cooler Upper Pipe Retaining Bolts At Driveline Support
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

4. Install the transmission fluid cooler pipe retaining bolts to the driveline support.

   Tighten: Tighten the bolt to 12 N.m (9 lb ft).

5. Check the transmission fluid level, add fluid if necessary. Refer to **Transmission Fluid**

Level Inspection.

6. Remove the drain pan.
7. Install the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** in Propeller Shaft.
8. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

TRANSMISSION FLUID COOLER LOWER PIPE REPLACEMENT - INTERMEDIATE TO DIFFERENTIAL COOLER

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Install a drain pan under the vehicle.

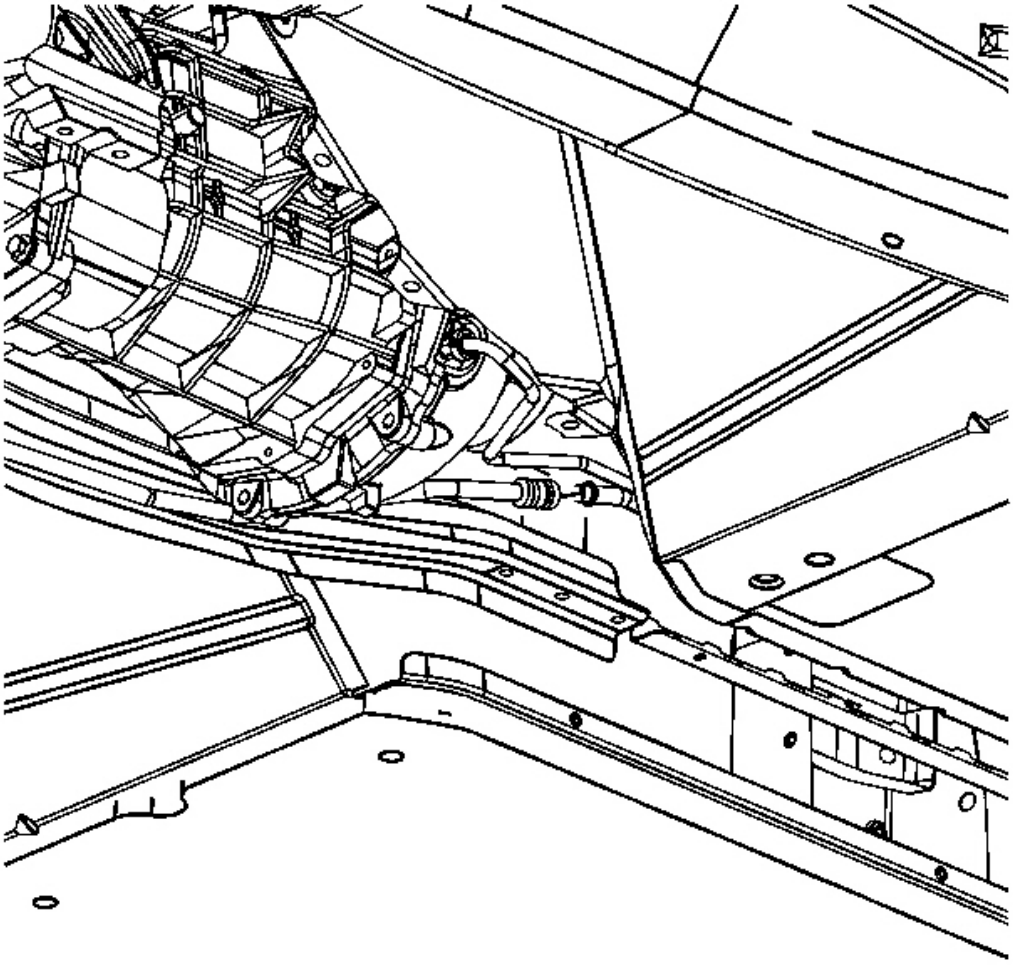


Fig. 124: View Of Intermediate Transmission Fluid Cooler Lower Pipe At Rear Transmission Lower Pipe
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Cap or plug the open transmission fluid cooler pipes immediately to prevent system contamination.

3. Disconnect the intermediate transmission fluid cooler lower pipe from the rear transmission lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

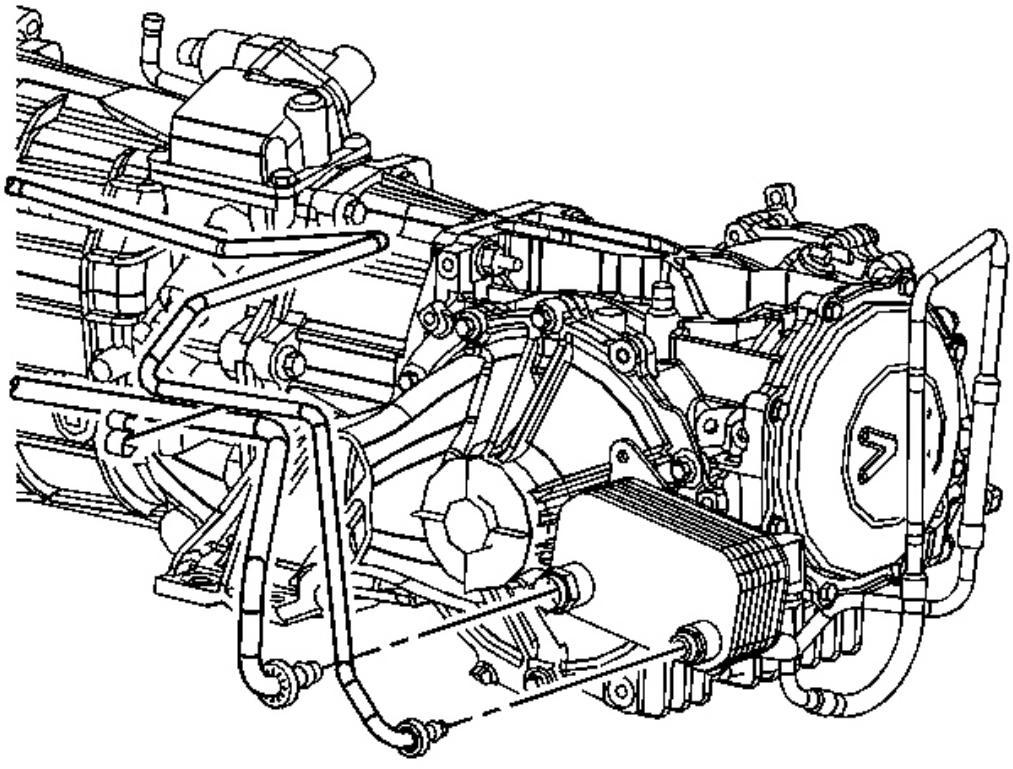


Fig. 125: Transmission Fluid Cooler Pipes At Differential Oil Cooler
Courtesy of GENERAL MOTORS CORP.

4. Remove the transmission cooler pipe clip.
5. Remove the rear transmission lower pipe from the differential oil cooler. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
6. Remove the rear transmission fluid cooler lower pipe from the vehicle.

Installation Procedure

1. Install the rear transmission fluid cooler lower pipe to the vehicle.

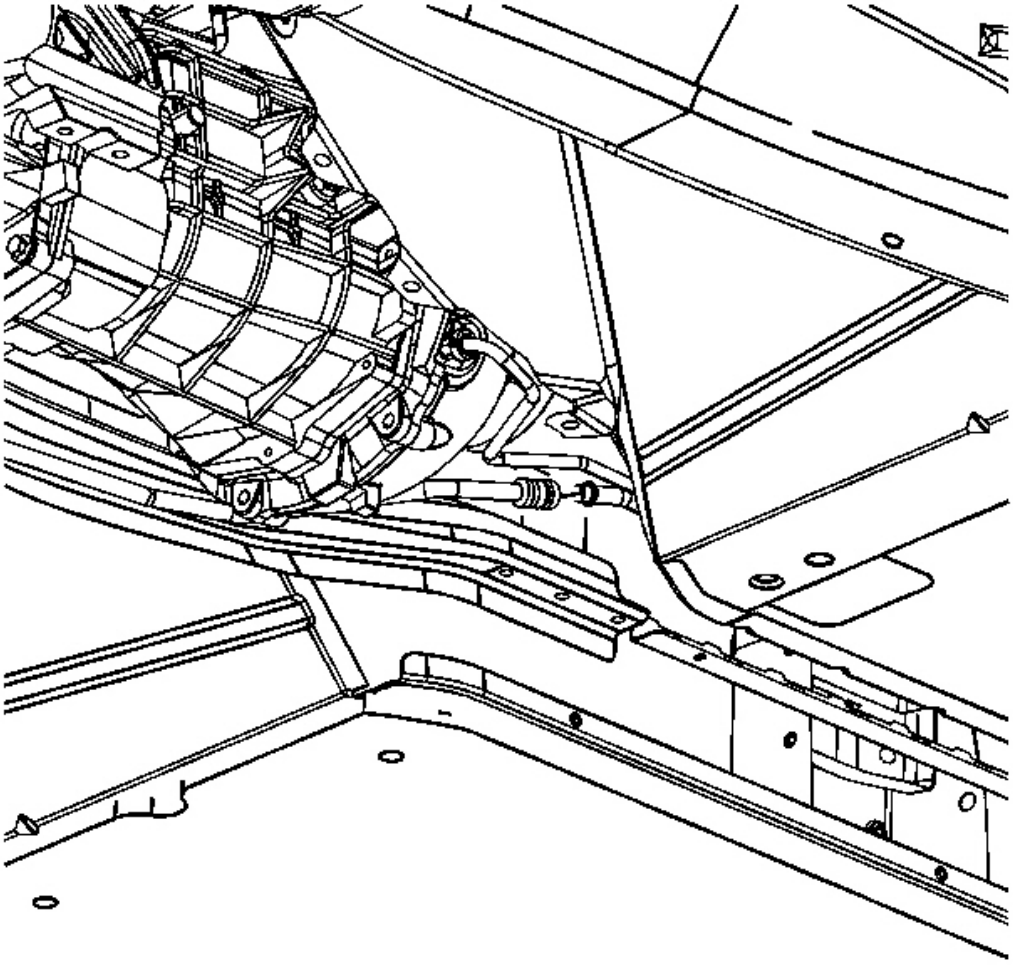


Fig. 126: View Of Intermediate Transmission Fluid Cooler Lower Pipe At Rear Transmission Lower Pipe
Courtesy of GENERAL MOTORS CORP.

2. Connect the rear transmission fluid cooler lower pipe to the intermediate transmission fluid cooler lower pipe. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.

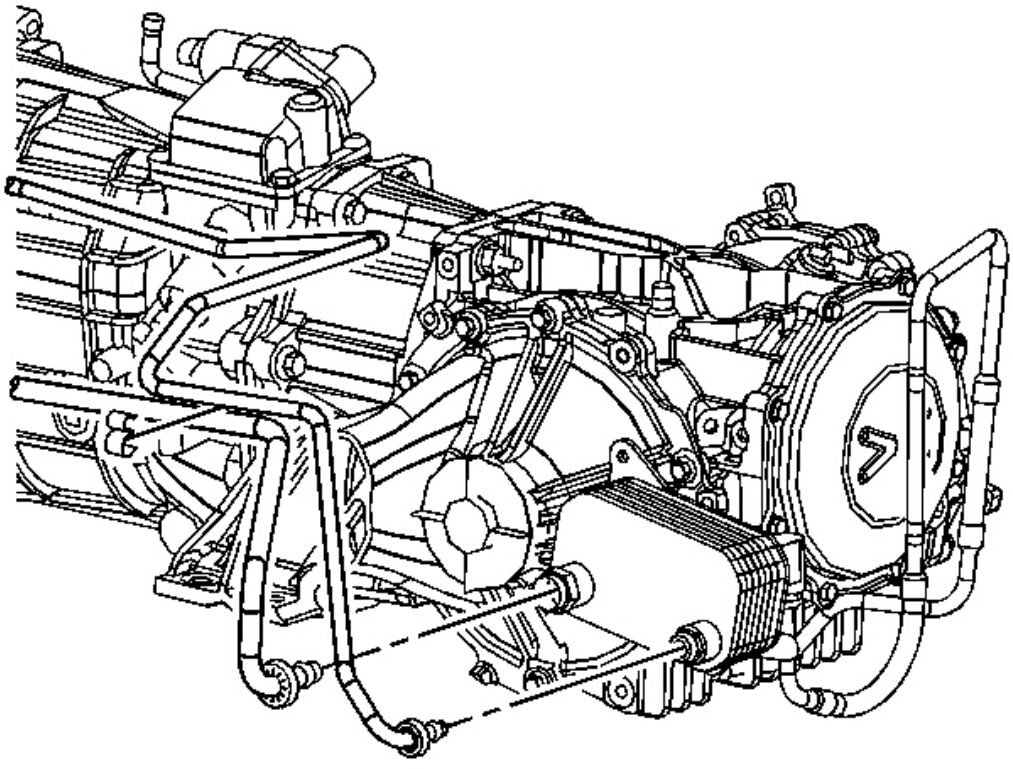


Fig. 127: Transmission Fluid Cooler Pipes At Differential Oil Cooler
Courtesy of GENERAL MOTORS CORP.

3. Connect the rear transmission fluid cooler lower pipe to the differential oil cooler. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Replacement**.
4. Install the transmission fluid cooler pipes clip.
5. Check the transmission fluid level, add fluid if necessary. Refer to **Transmission Fluid Level Inspection**.
6. Remove the drain pan.
7. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

TRANSMISSION REPLACEMENT

Tools Required

J 42055 Transmission Support Fixture

Removal Procedure

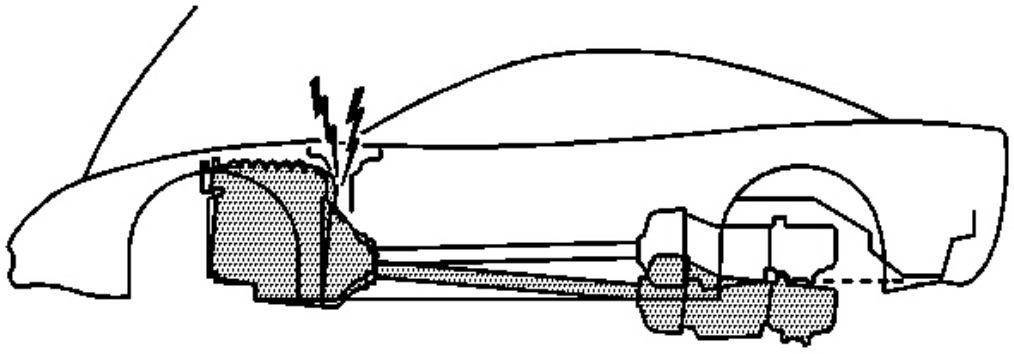


Fig. 128: Tilting Down Rear Of Driveline
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution .

NOTE: When tilting down the rear of the driveline, observe the clearance between the rear of the engine and the composite dash panel. Do not allow the engine to rest unsupported against the composite dash panel, or vehicle damage may result.

NOTE: When lowering and removing the rear of the driveline, observe the clearance between the rear of the transaxle assembly and the underbody to prevent damage.

NOTE: When tilting down the rear of the driveline, insert a putty knife or similar tool between the shift control bracket on the driveline support assembly and the brake pipe retainer on the driveline tunnel wall to prevent damage.

1. Disconnect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection (6.0L)** or **Battery Negative Cable Disconnection and Connection (7.0L)** .

2. Remove the console. Refer to **Console Replacement** .
3. Remove the instrument panel (I/P) accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .
4. Remove the shift control closeout boot. Refer to **Shift Control Shift Closeout Boot Replacement**.
5. Remove the shift control assembly. Refer to **Shift Control Assembly Replacement**.
6. Remove the left I/P lower insulator panel. Refer to **Instrument Panel Insulator Panel Replacement** .

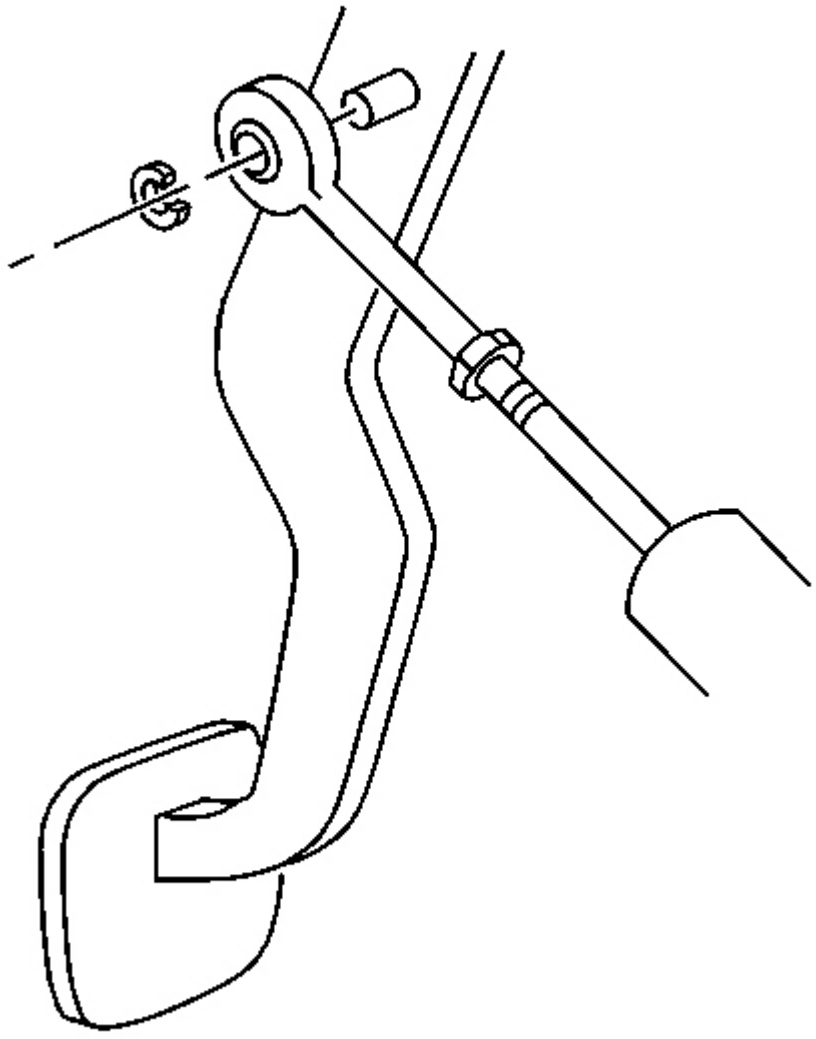


Fig. 129: View Of Master Cylinder Push Rod To Clutch Pedal
Courtesy of GENERAL MOTORS CORP.

7. Remove the clutch master cylinder pushrod retainer.
8. Disconnect the clutch master cylinder pushrod from the clutch pedal.
9. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

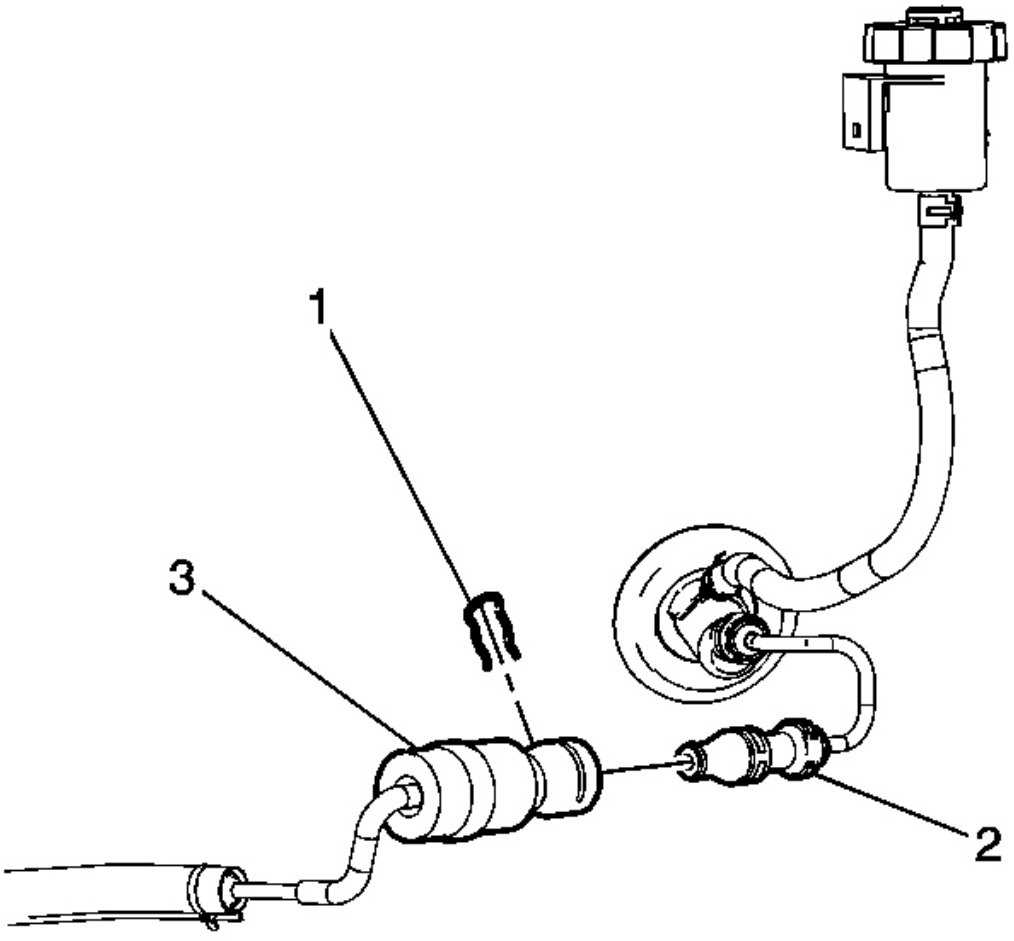


Fig. 130: View Of Clutch Hose, Retaining Clip & Master Cylinder Connection
Courtesy of GENERAL MOTORS CORP.

10. Remove the clutch actuator cylinder hose (3) from the hose retaining clip below the power brake booster.
11. Remove the hose retaining clip (1) then separate the hoses (2, 3).

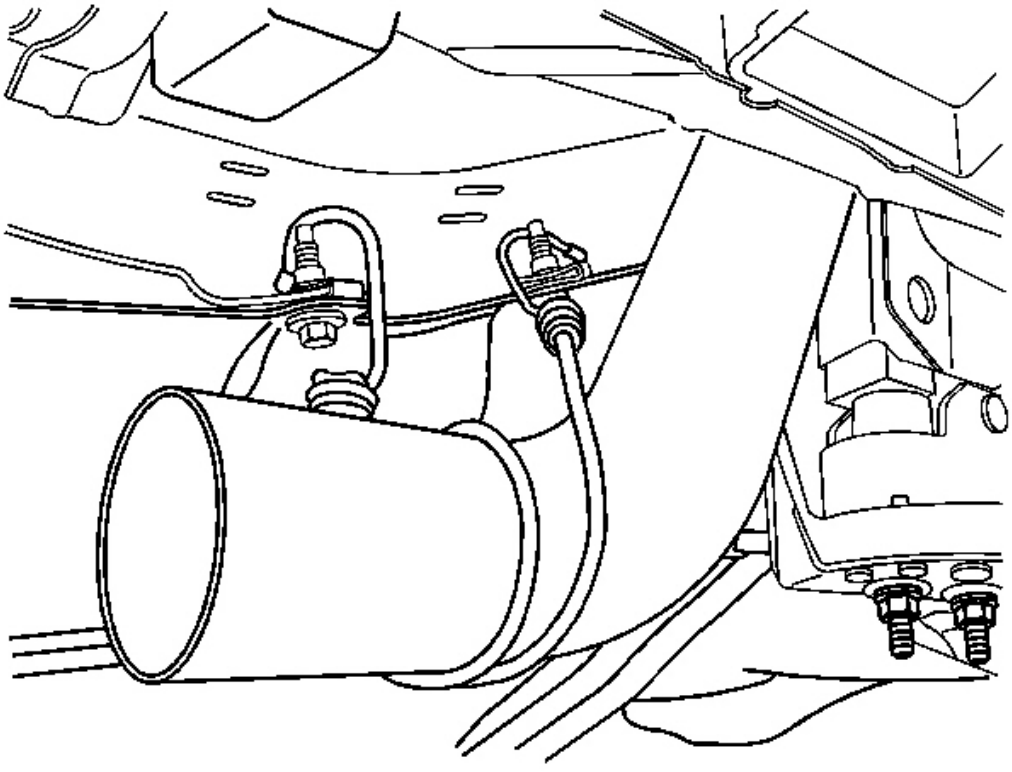


Fig. 131: View Of Tied Off Muffler Assembly
Courtesy of GENERAL MOTORS CORP.

12. Remove the rear tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .
13. Remove the intermediate pipe. Refer to **Intermediate Pipe Replacement (6.0L)** or **Intermediate Pipe Replacement (7.0L)** .
14. Tie off the muffler assemblies to the underbody to support out of the way.
15. Remove the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** .

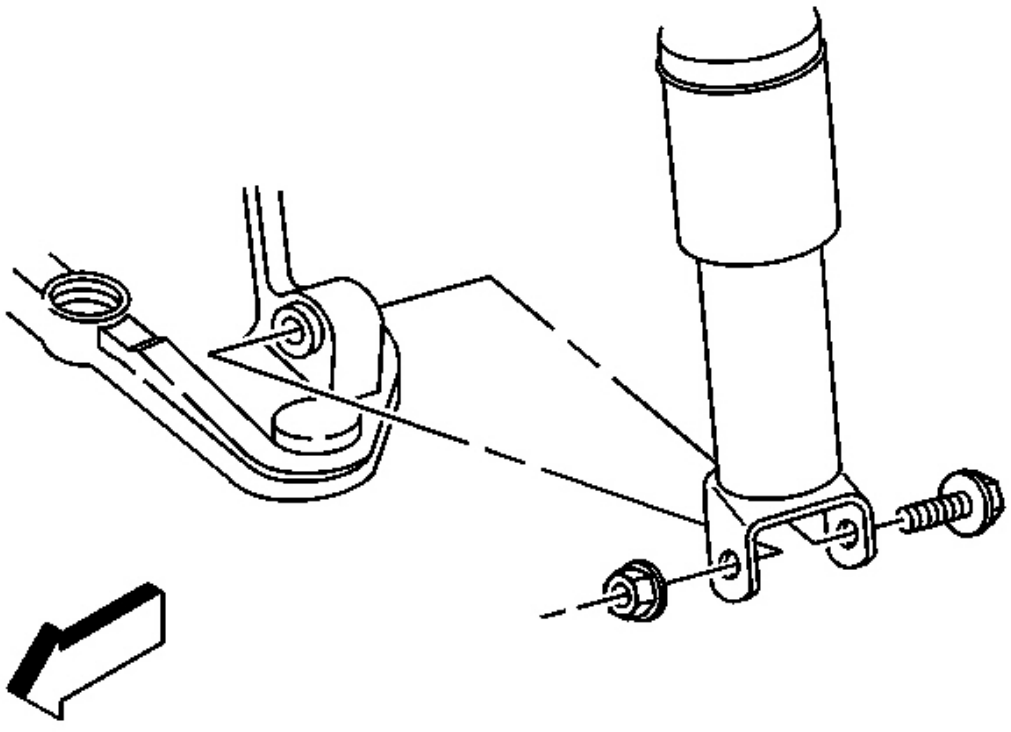


Fig. 132: View Of Shock Absorber Mounting To Control Arm
Courtesy of GENERAL MOTORS CORP.

16. Install J 33432-A transverse spring compressor. Refer to **Rear Transverse Spring Replacement** .
17. Compress the rear traverse spring.
18. Disconnect the outer tie rod end from the suspension knuckle. Refer to **Tie Rod Replacement (Inner)** .
19. Remove the shock absorber lower mounting bolt.
20. Disconnect the lower ball joint from the suspension knuckle. Refer to **Knuckle Replacement** .
21. Remove the straight jack from the control arm.
22. Repeat steps 16 through 21 for the other side of the vehicle.

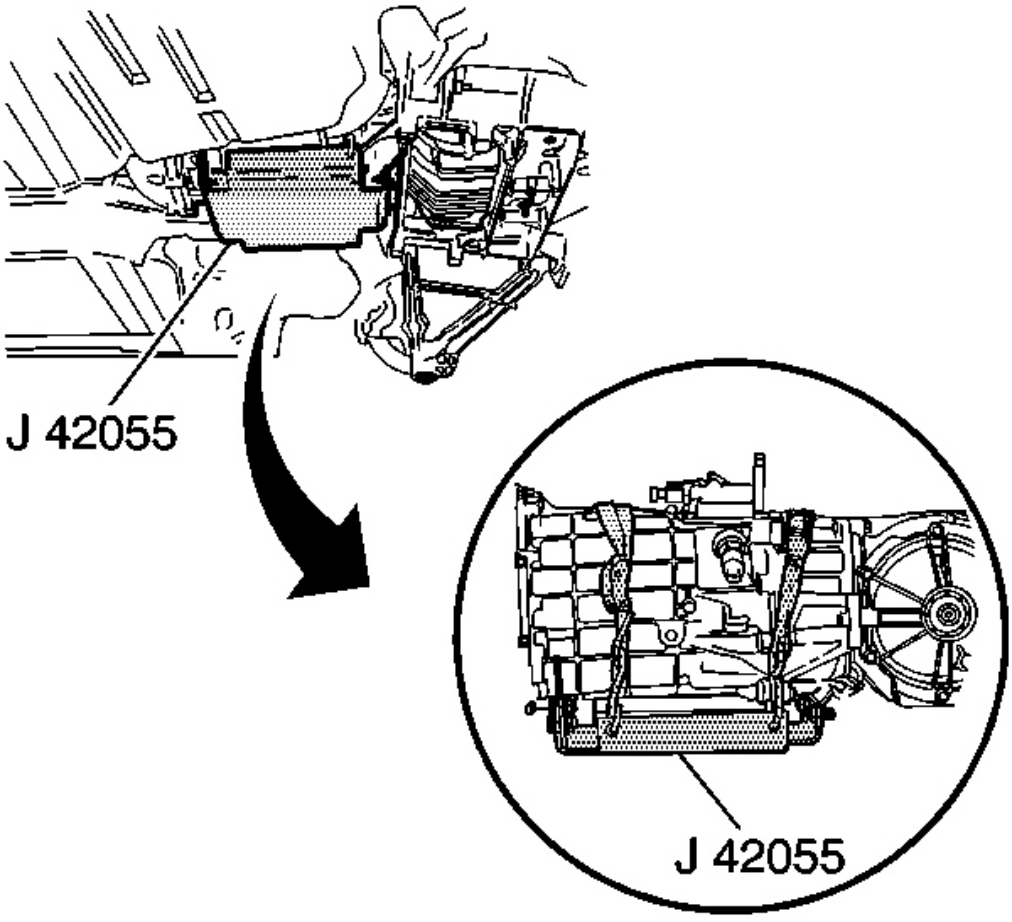


Fig. 133: Transmission Jack To Transmission
Courtesy of GENERAL MOTORS CORP.

23. Assemble the **J 42055** .
24. Install the **J 42055** to a transmission jack.
25. Position and firmly secure the **J 42055** with the transmission jack to the transmission.
26. Disconnect the wiring harness and brake pipe clip retainers from the rear suspension crossmember.
27. Remove the differential to transmission lower nut.

(Removing the nut at this time will aid in separating the differential from the transmission

after the driveline has been removed from the vehicle.)

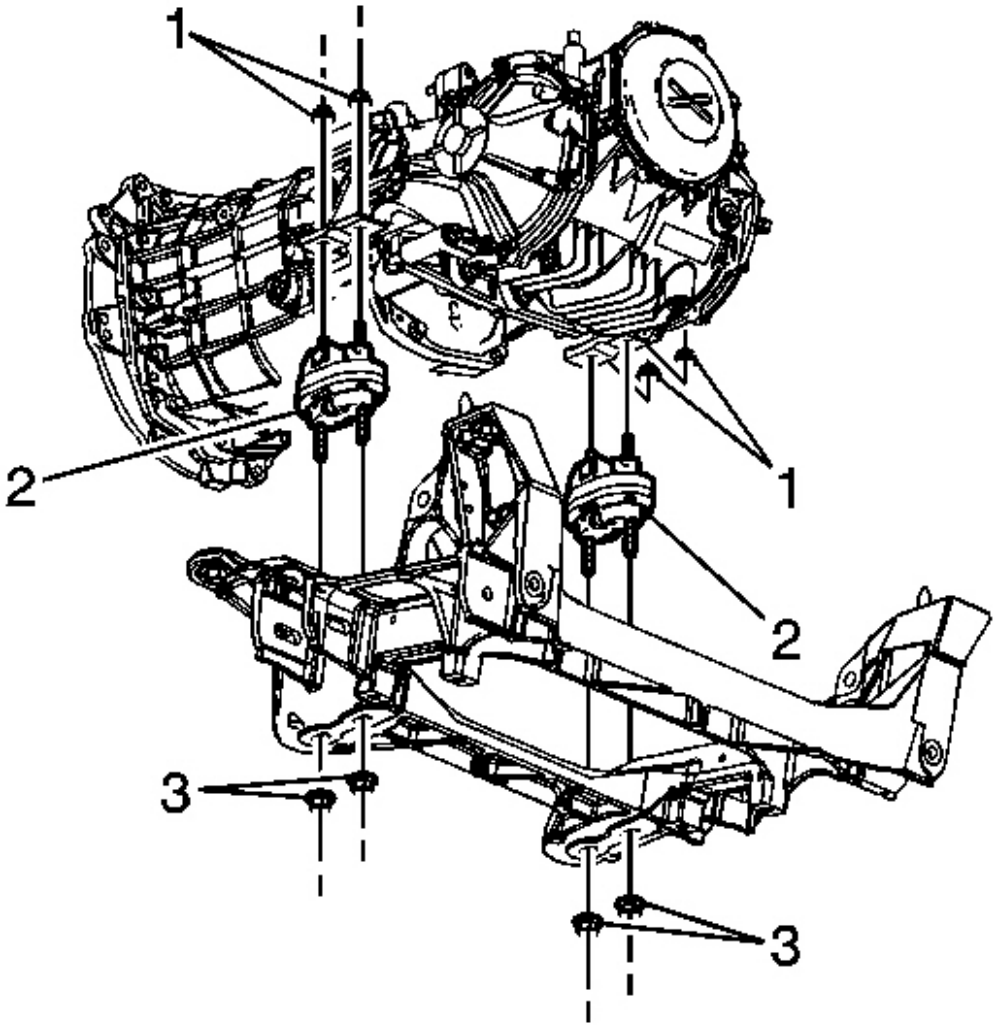


Fig. 134: View Of Transaxle Mounts & Nuts
Courtesy of GENERAL MOTORS CORP.

28. Remove the transaxle mount (2) to rear crossmember nuts (3).

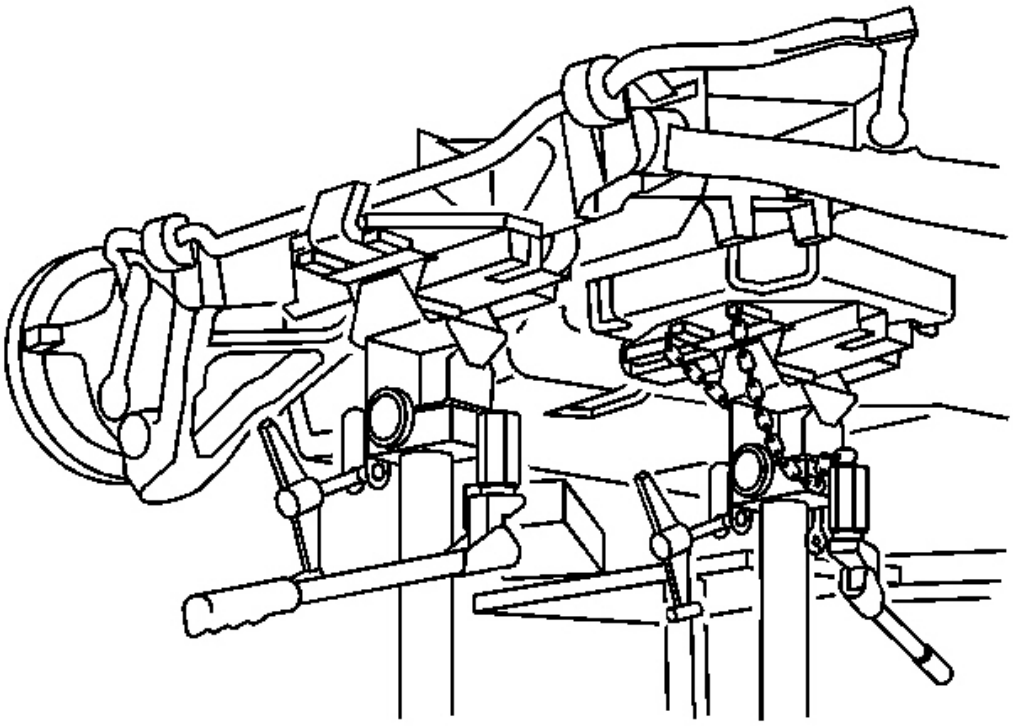


Fig. 135: View Of Correct Transmission Jack Placement
Courtesy of GENERAL MOTORS CORP.

29. Position a transmission jack under the rear suspension crossmember and firmly secure the crossmember to the jack.
30. Using ONLY HAND TOOLS, remove the rear suspension crossmember retaining nuts.

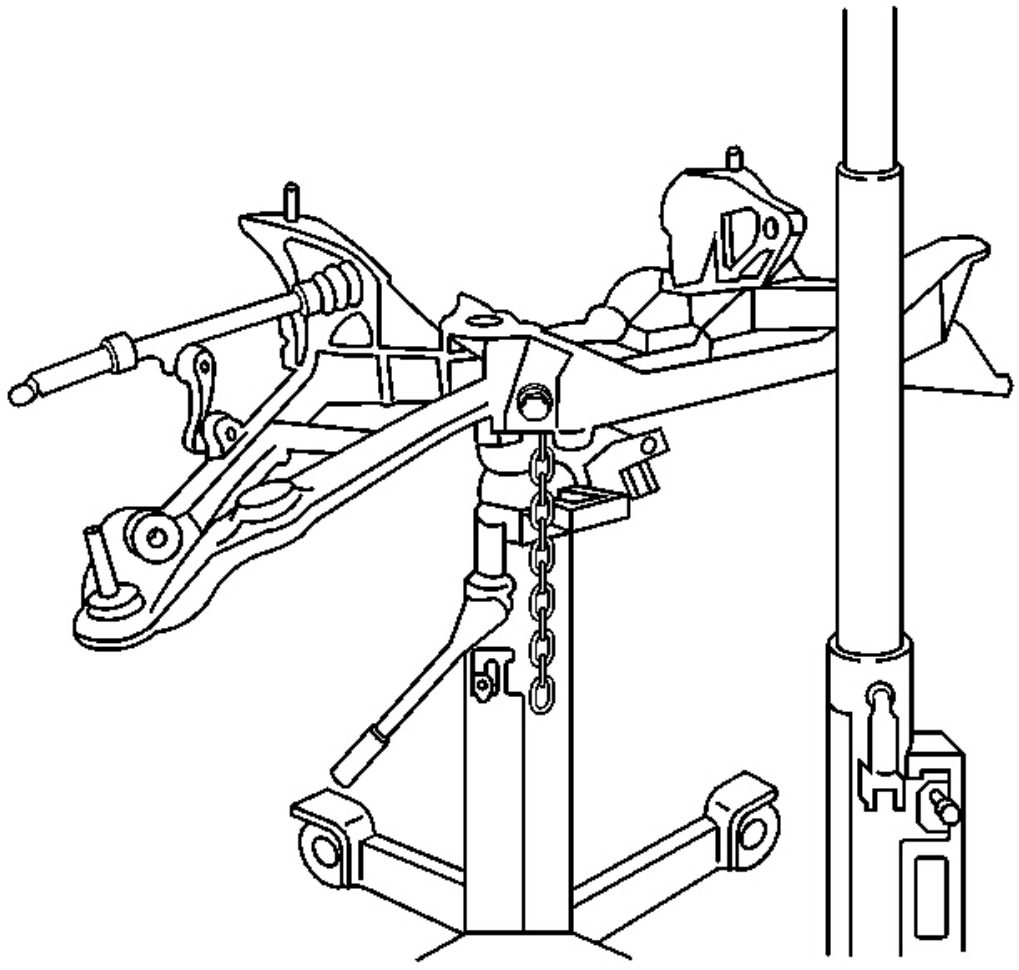


Fig. 136: View Of Rear Suspension Crossmember
Courtesy of GENERAL MOTORS CORP.

31. With the aid of an assistant, slowly lower the rear suspension crossmember away from the vehicle frame rails and remove the crossmember.

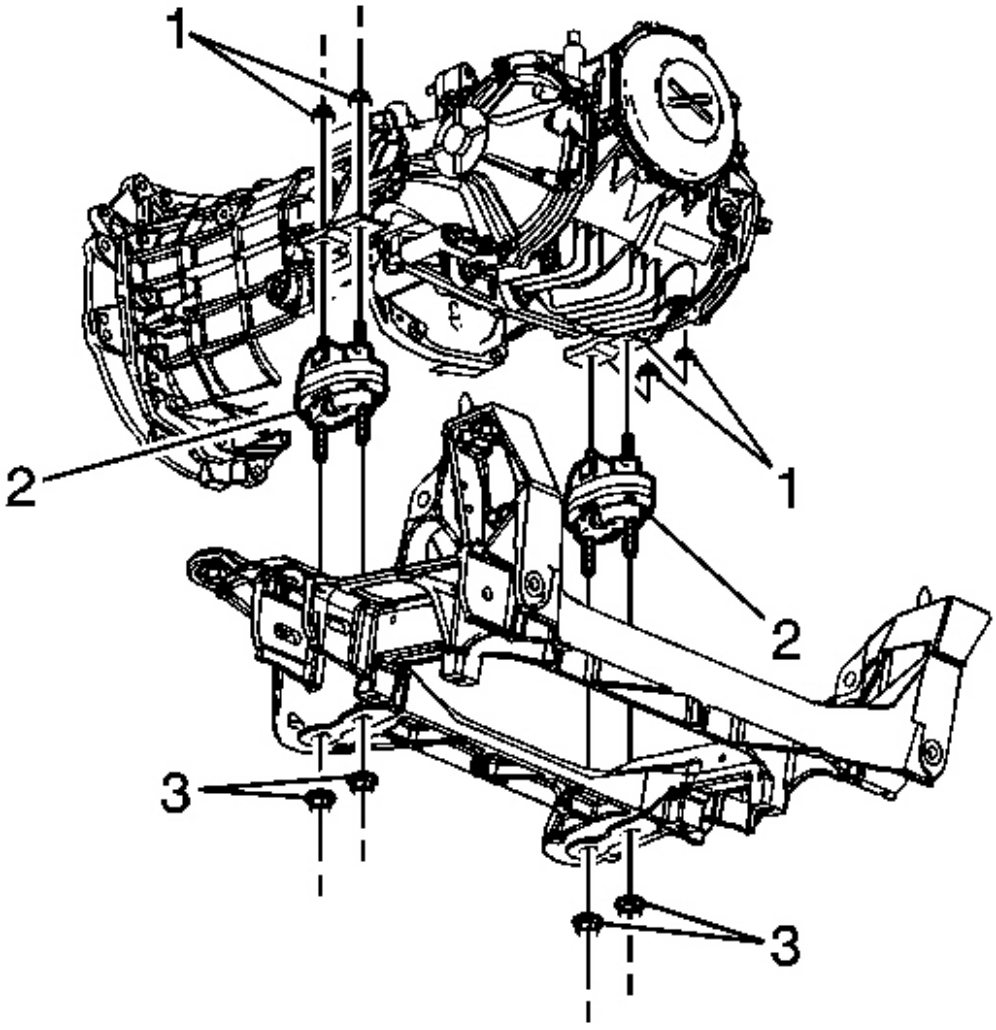


Fig. 137: View Of Transaxle Mounts & Nuts
Courtesy of GENERAL MOTORS CORP.

32. Remove the transaxle mount (2) to differential nuts (1).

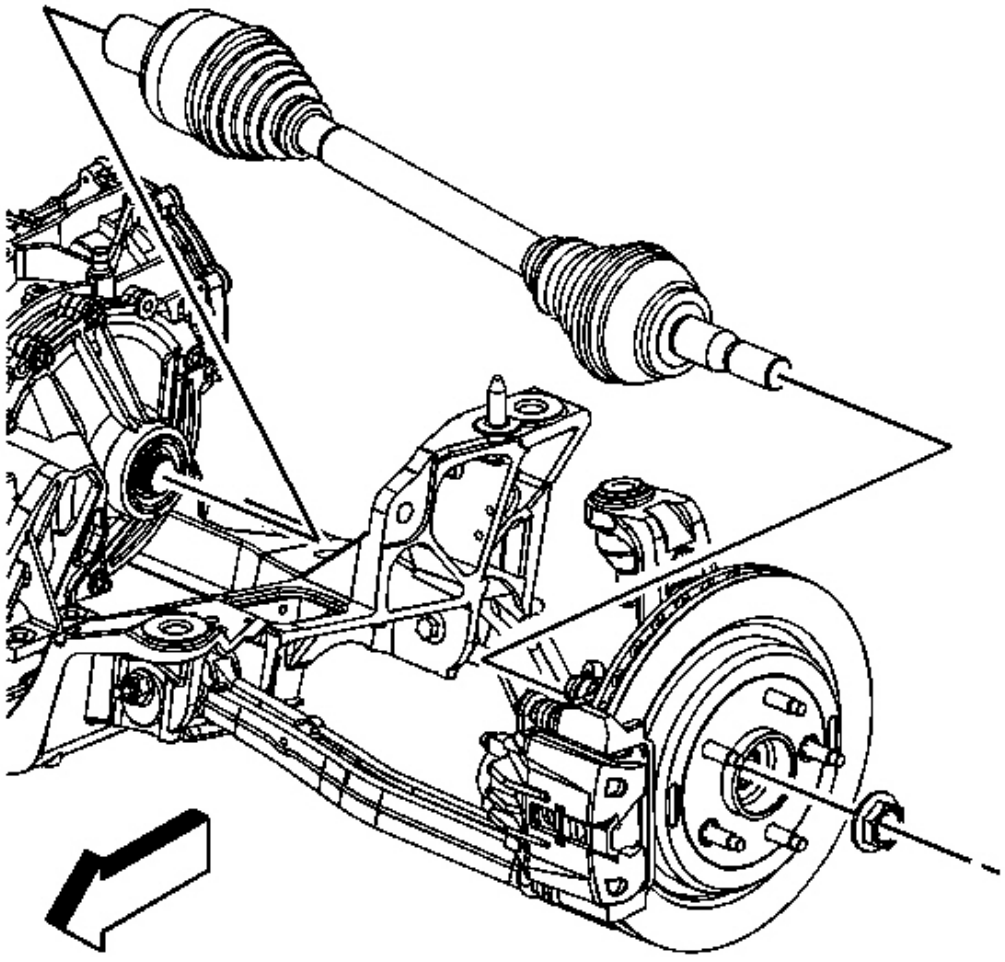


Fig. 138: View Of Wheel Drive Shaft
Courtesy of GENERAL MOTORS CORP.

33. Using a pry bar, CAREFULLY release the axle shafts from the differential.
34. Tie off the axle shafts to the underbody to support out of the way.

The muffler assembly pipes toward the rear offer a good location to help support the axle shafts.

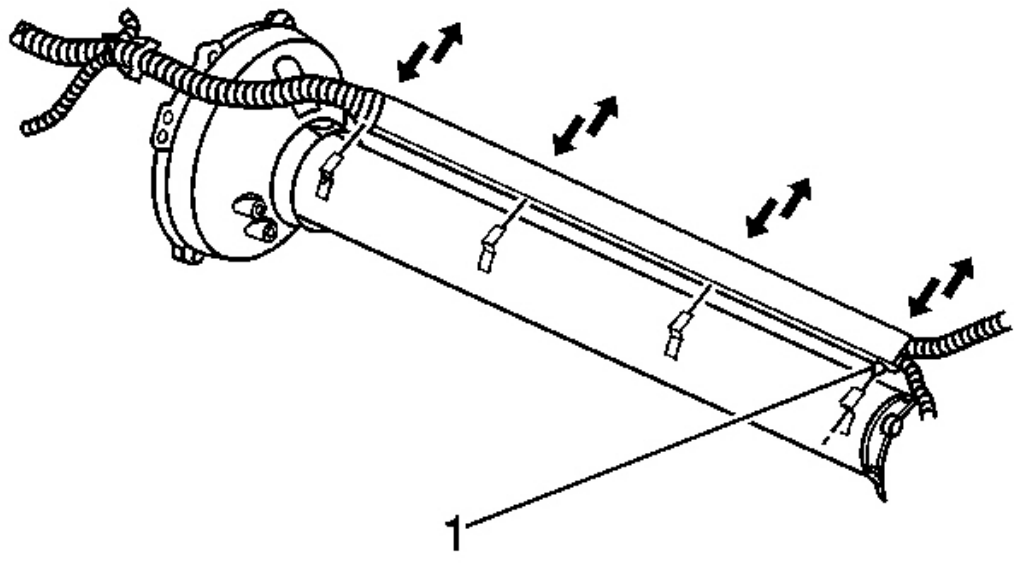


Fig. 139: Wiring Harness To L-Shaped Brackets At Driveline Support Assembly
Courtesy of GENERAL MOTORS CORP.

35. Release the retainer (1) securing (and positioning) the wiring harness to the L-shaped brackets along the driveline support assembly, then slide the harness up out of the brackets and position out of the way.

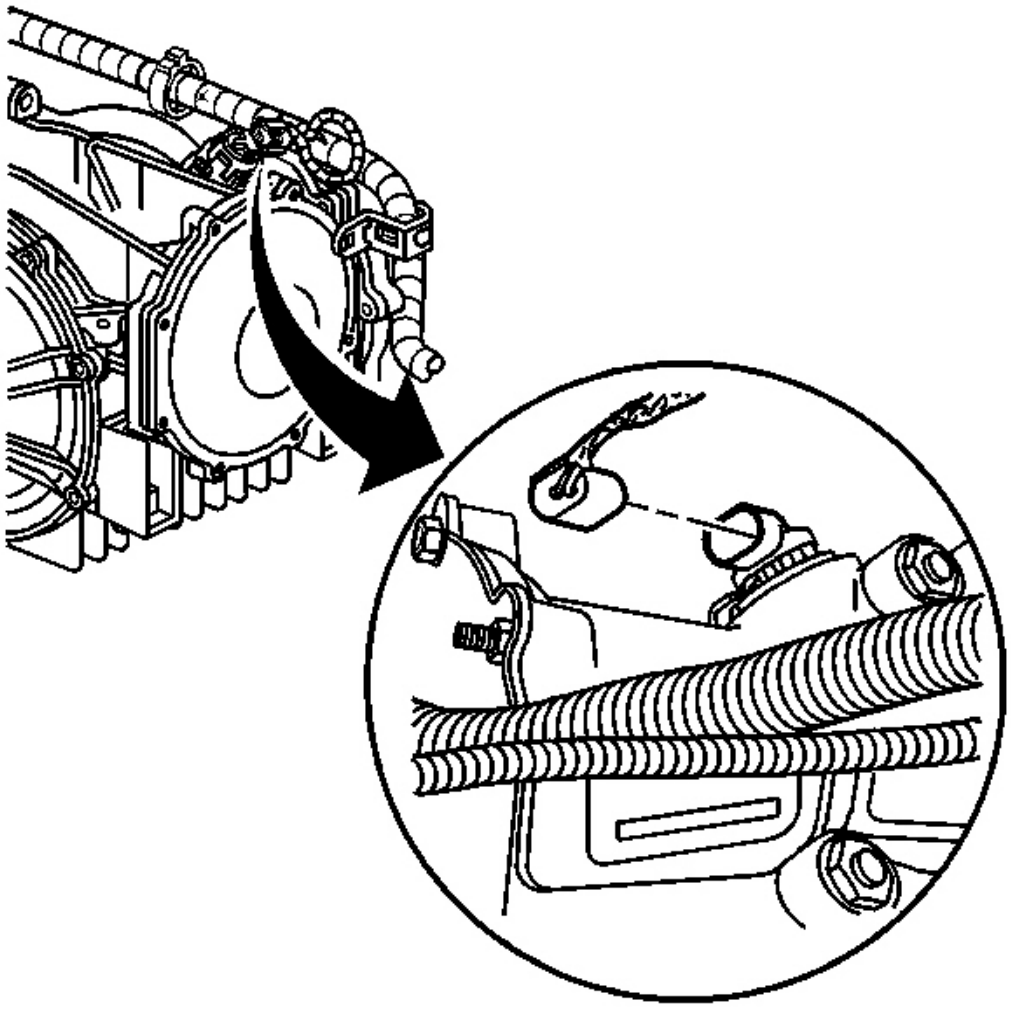


Fig. 140: Vehicle Speed Sensor (VSS) Electrical Connector
Courtesy of GENERAL MOTORS CORP.

36. SLOWLY lower the driveline approximately 5 cm (2 in), while simultaneously adjusting the angle of tilt, in order to access the electrical connectors.
37. Disconnect the vehicle speed sensor (VSS) electrical connector.

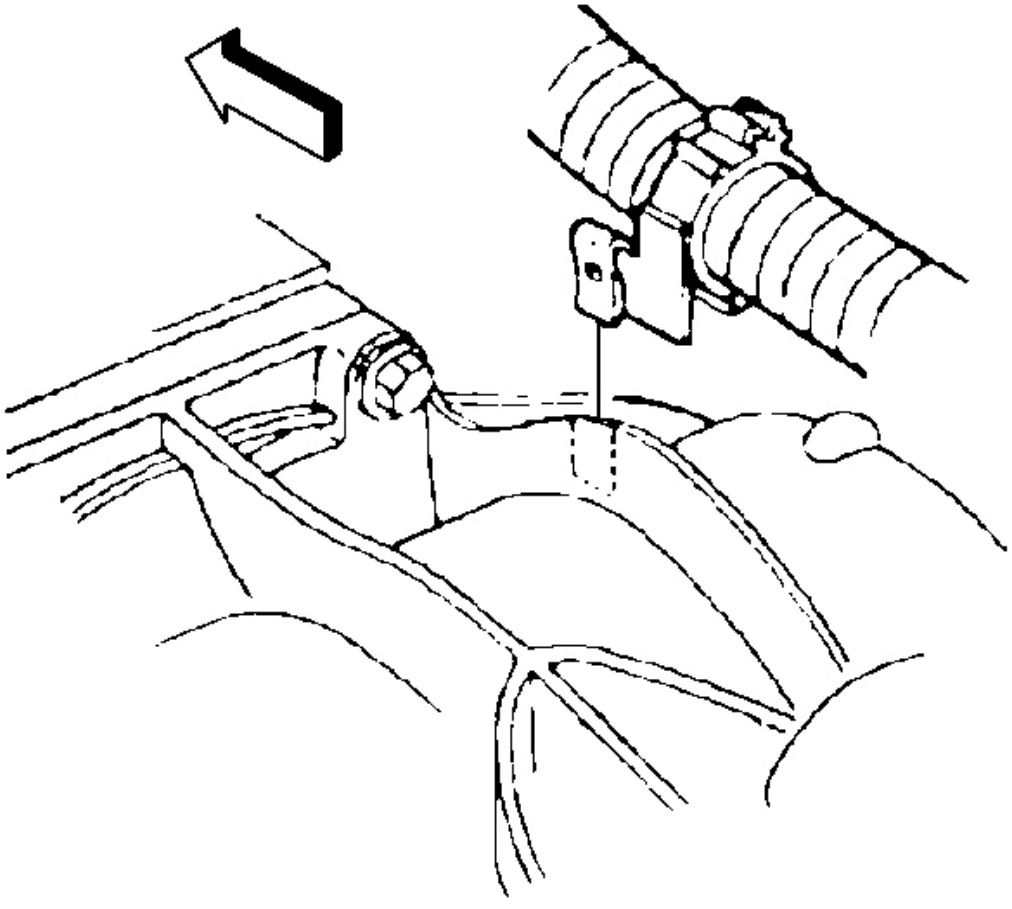


Fig. 141: Wiring Harness Retainer To Stud At Differential Rear Cover
Courtesy of GENERAL MOTORS CORP.

38. Disconnect the wiring harness retainer from the stud at the differential rear cover.
39. Disconnect the wiring harness retainer clip from the top of the differential.

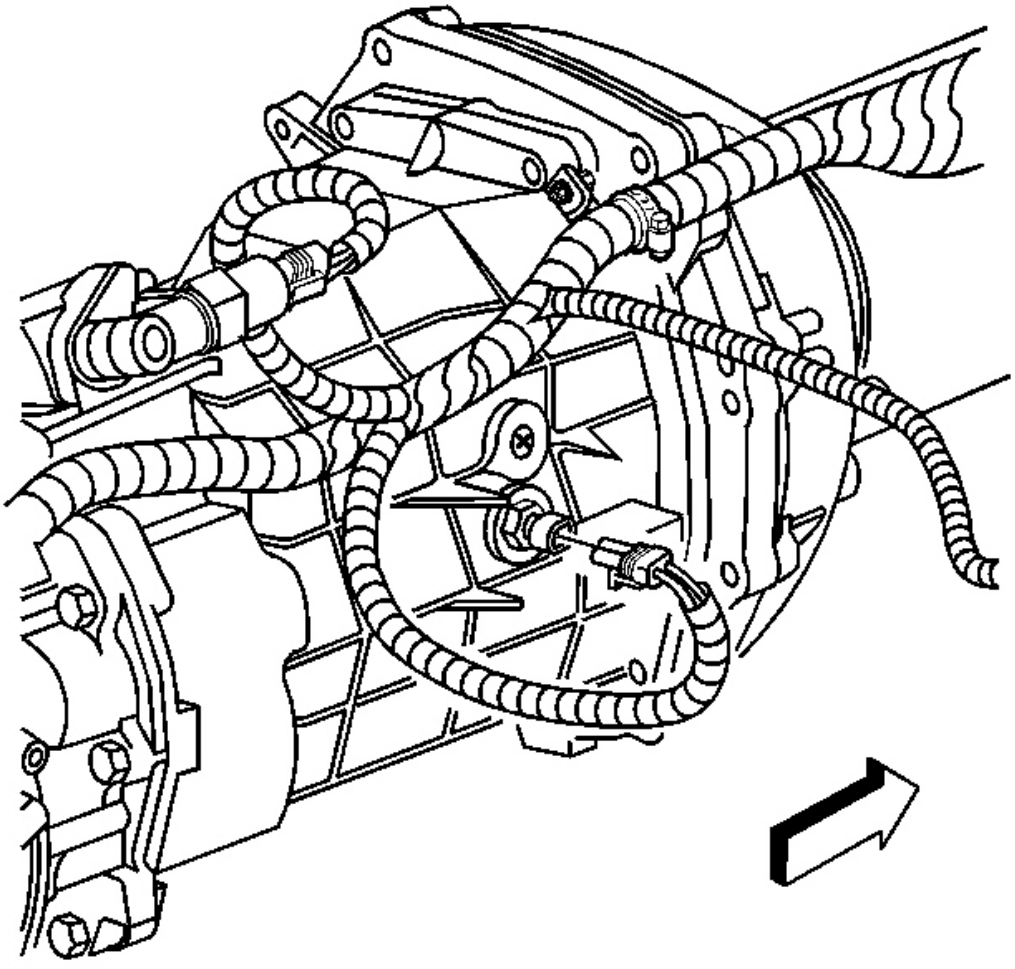


Fig. 142: Backup Lamp Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

40. Disconnect the backup lamp switch electrical connector.

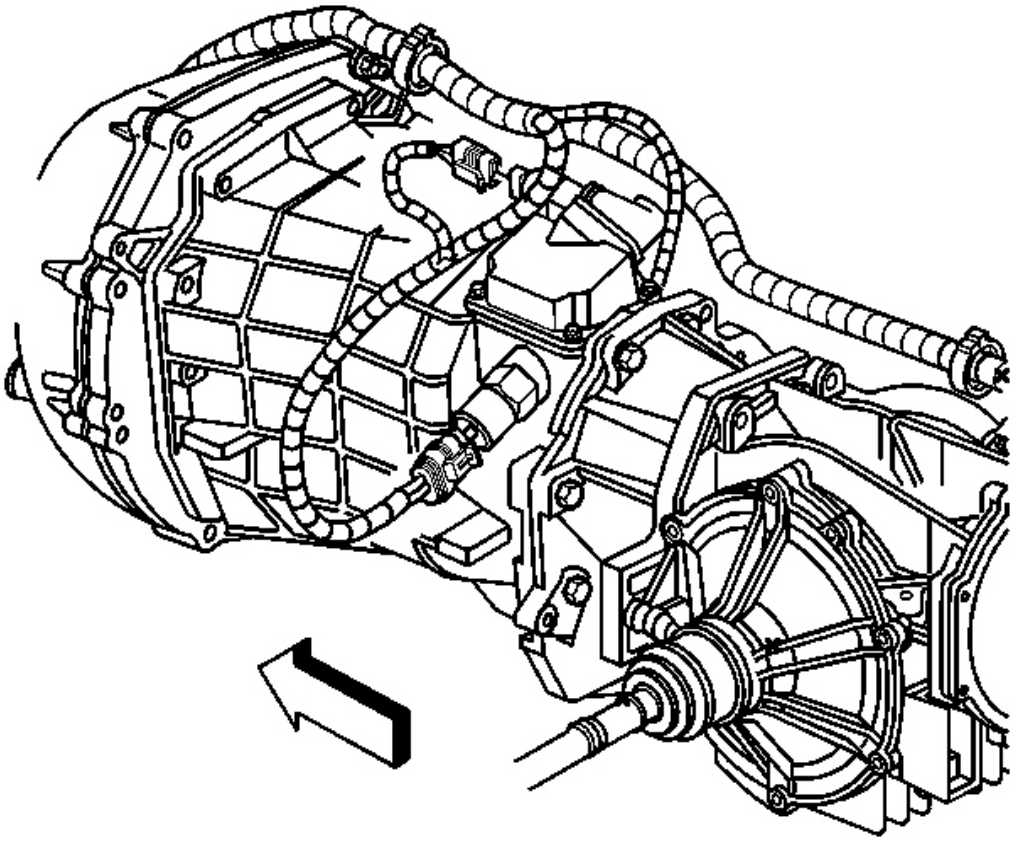


Fig. 143: Reverse Lockout Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

41. Disconnect the reverse lockout solenoid electrical connector.

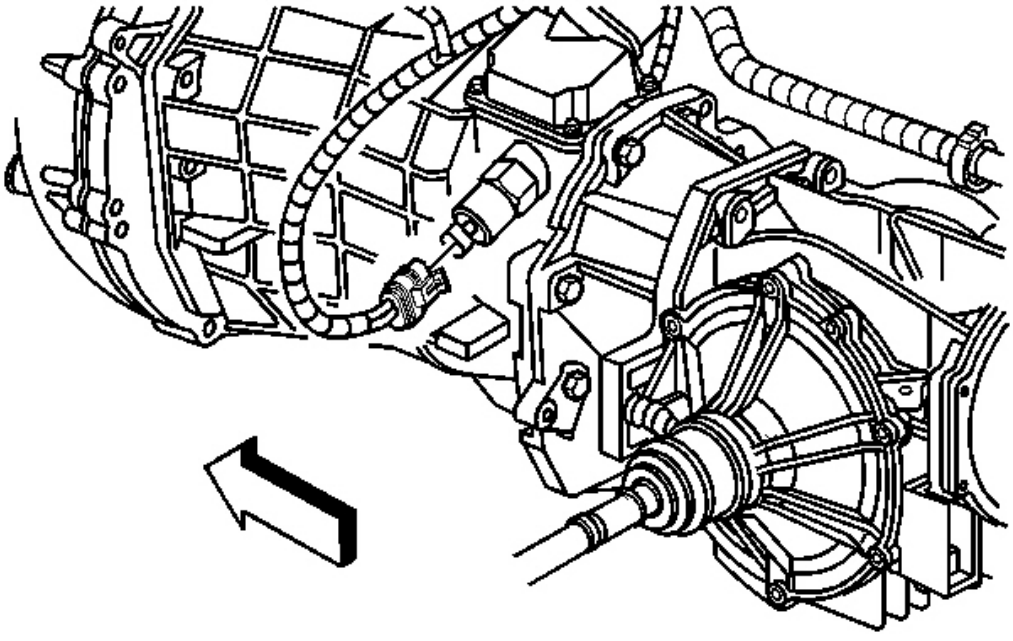


Fig. 144: Gear Select (Skip Shift) Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

42. Disconnect the gear select (skip shift) solenoid electrical connector.

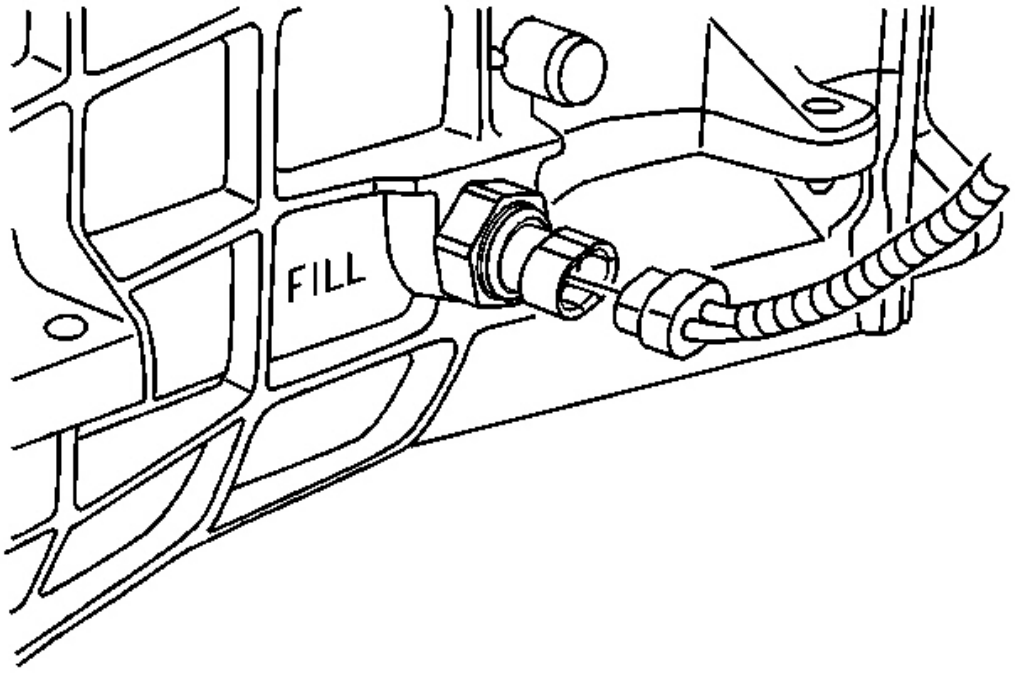


Fig. 145: Transmission Fluid Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

43. Disconnect the transmission fluid temperature sensor electrical connector, if equipped.

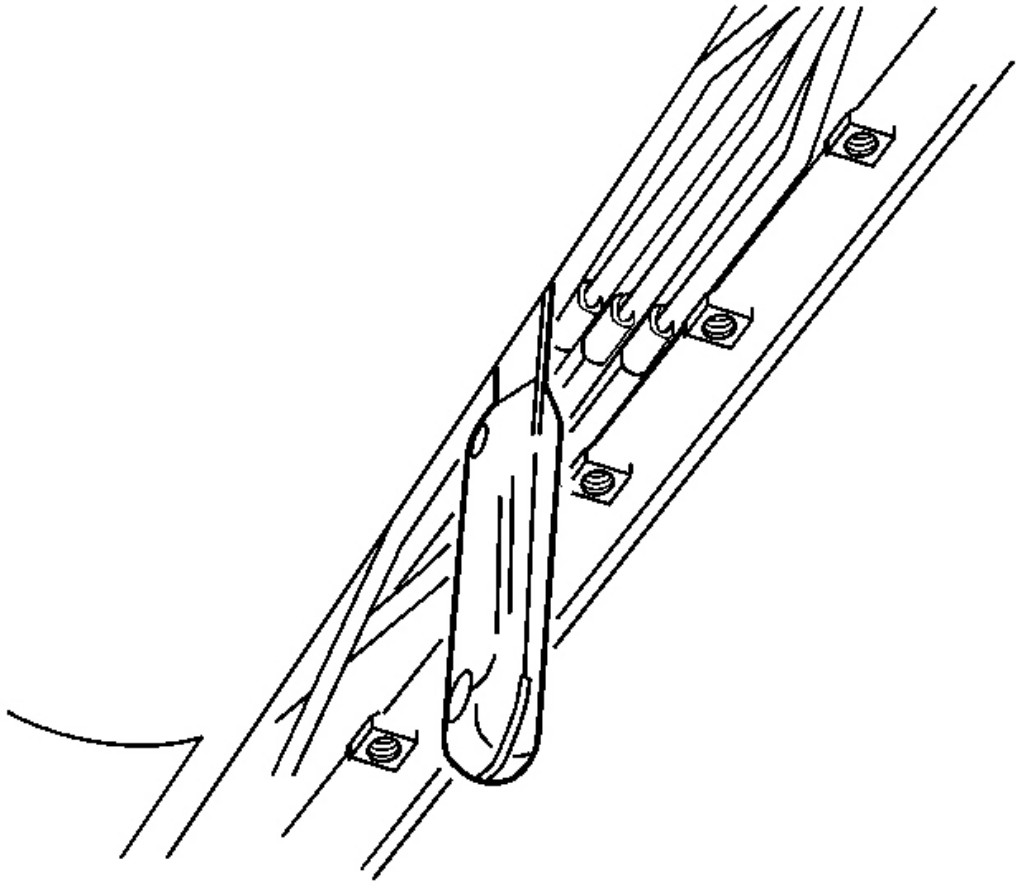


Fig. 146: Edge Of Shifter Bracket On Side Of Driveline Support Assembly & Brake Pipe Retainer
Courtesy of GENERAL MOTORS CORP.

44. Insert a putty knife, or similar tool, between the edge of the shifter bracket on the side of the driveline support assembly and the brake pipe retainer on the wall of the driveline tunnel.

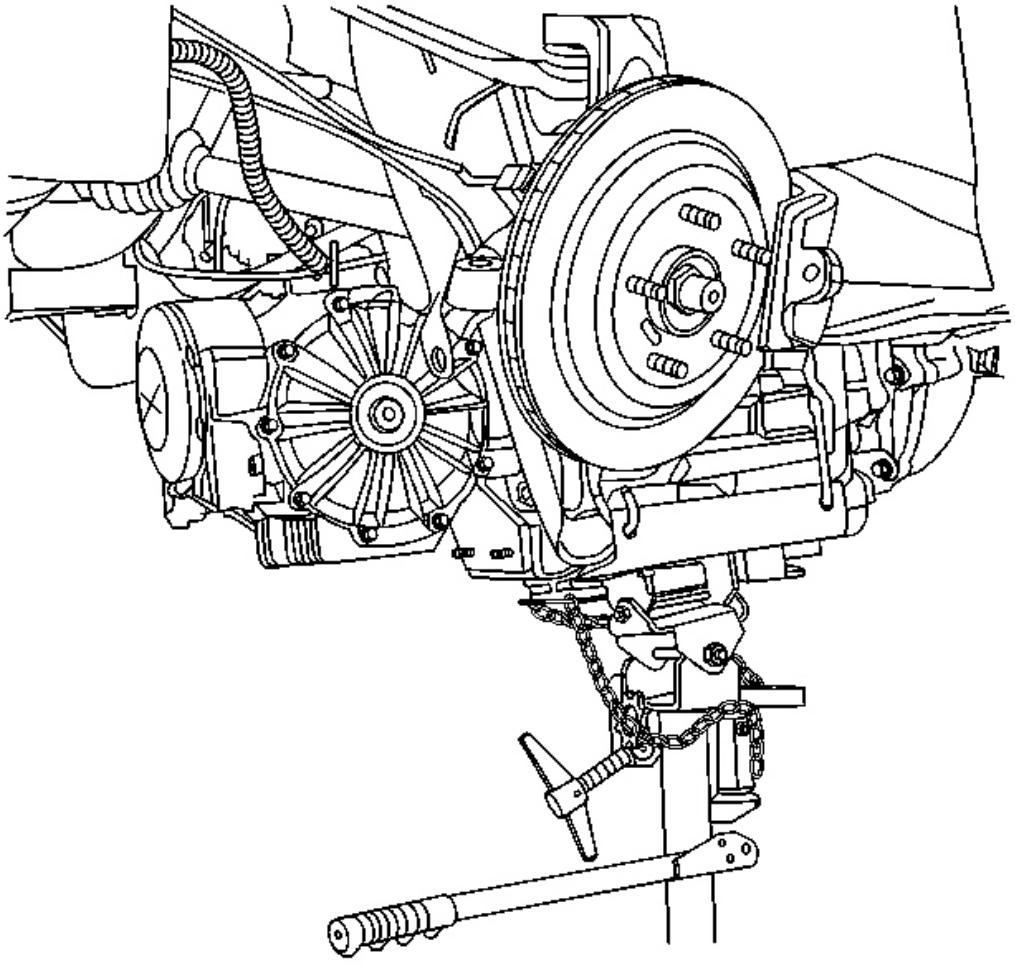


Fig. 147: Wiring Harness To Harness Retainer At Top Of Transmission
Courtesy of GENERAL MOTORS CORP.

45. SLOWLY lower the driveline, while simultaneously adjusting the angle of tilt, and observe the relationship between the top rear of the differential and the lowest part of the rear compartment panel floor (the center storage compartment between the frame rails); the differential should not be lowered more than approximately EVEN with the specified body point of reference.

    (The engine positive crankcase ventilation (PCV) pipes which route along the rear of the engine intake manifold will likely contact the dash panel.)

46. Release the wiring harness from the harness retainer along the top of the transmission.
47. Check to be sure that the wiring harness is free from the driveline being removed.

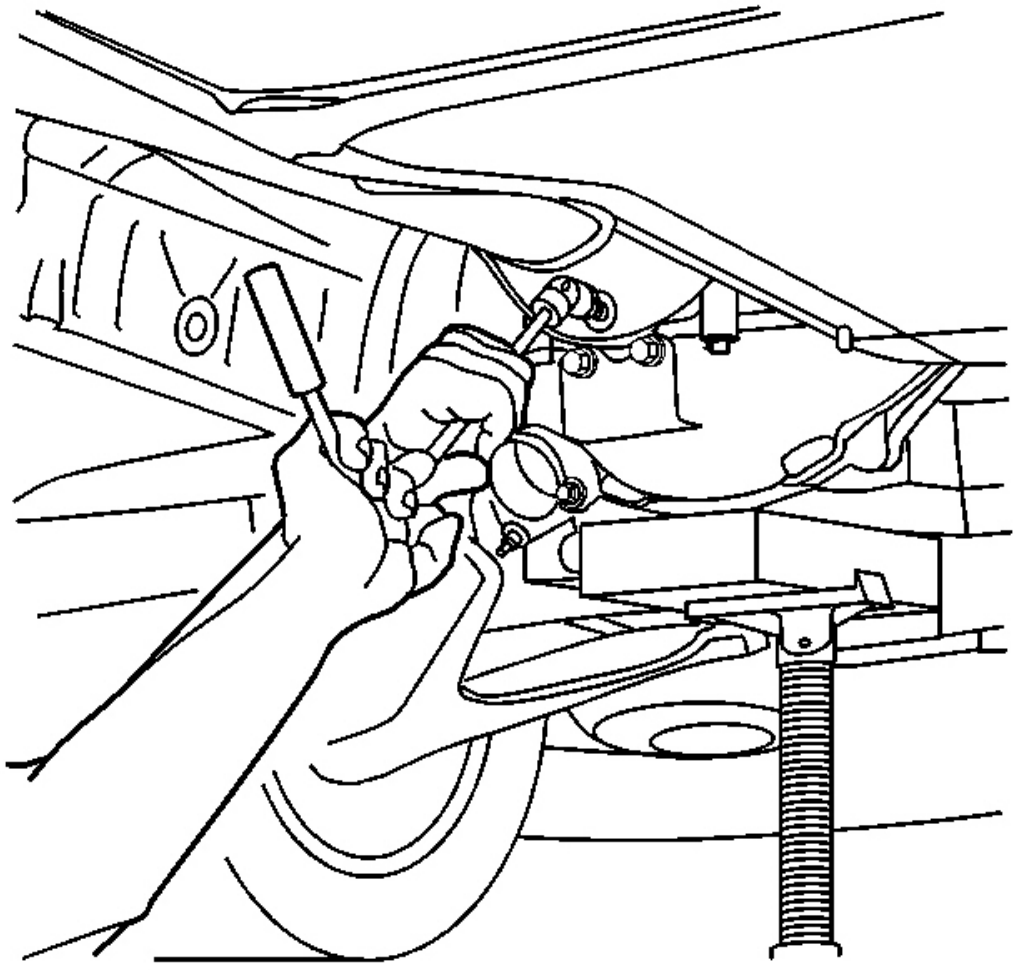


Fig. 148: Driveline Support Assembly To Engine Flywheel Housing Bolts
Courtesy of GENERAL MOTORS CORP.

48. Using a block of wood to protect the engine oil pan, place a straight jack under the rear of the engine oil pan to support the engine from stressing the composite dash panel.
49. Remove the five driveline support assembly to engine flywheel housing bolts.
50. Carefully bend the wiring harness bracket away from the driveline toward the driveline tunnel wall in order to make a clear removal path for the driveline.

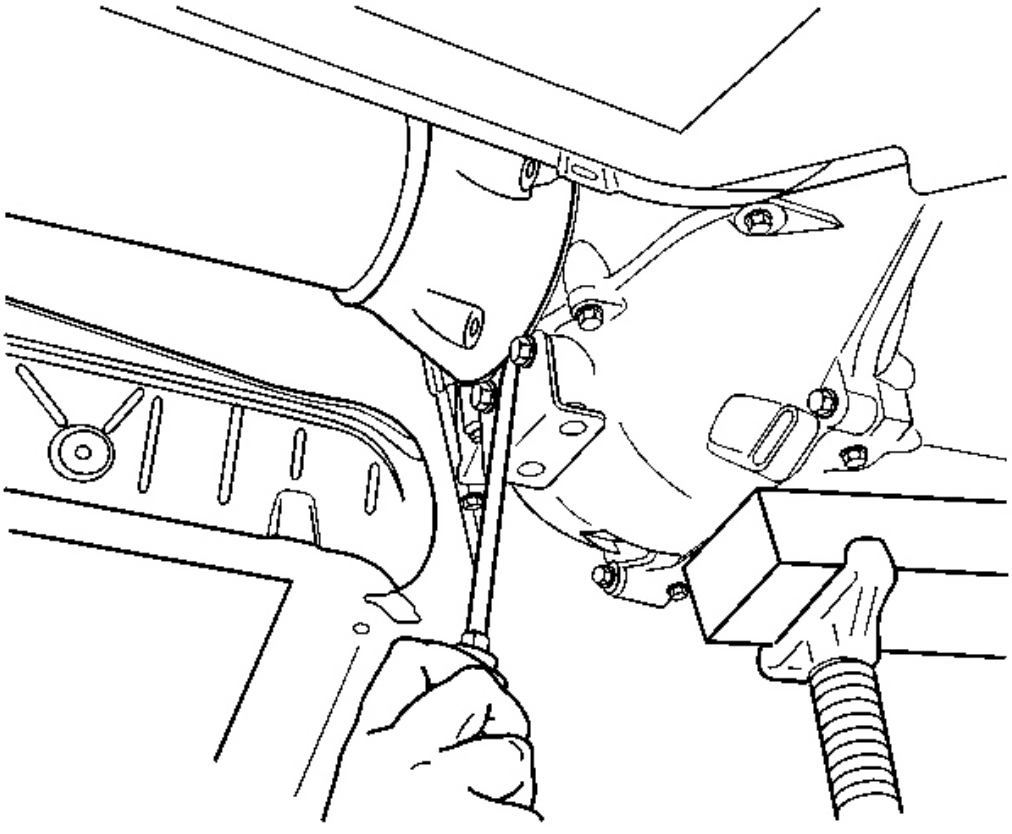


Fig. 149: Edge Of Driveline Support Assembly & Engine Flywheel Housing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The aid of an assistant will be necessary for the remaining steps.

51. Have an assistant insert a flat bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the engine flywheel housing, then begin to pry the driveline loose from the engine.

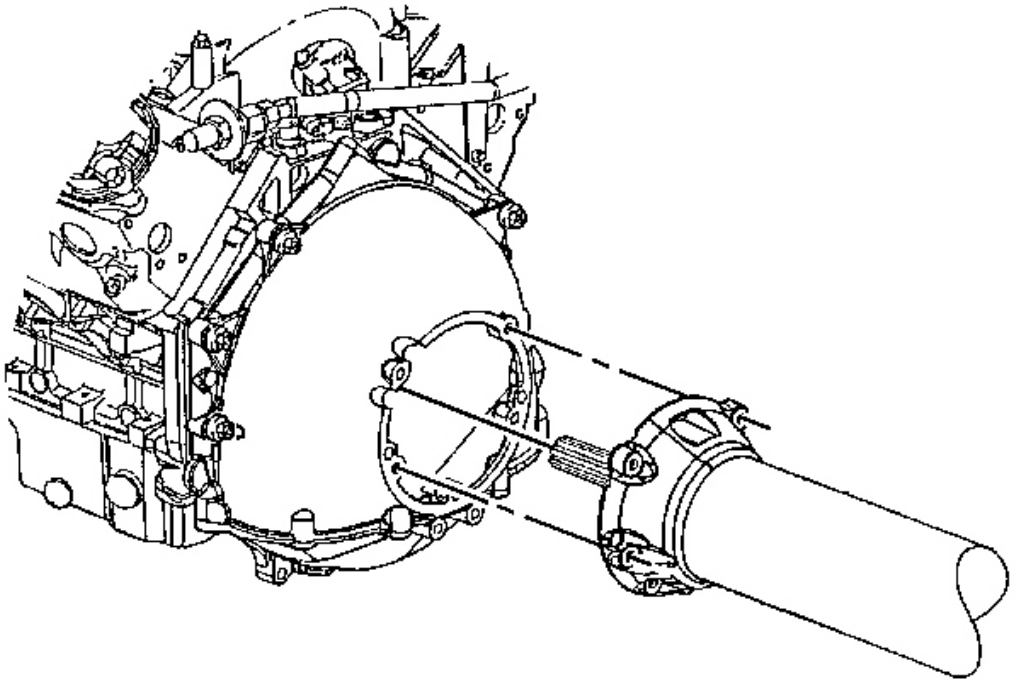


Fig. 150: Propeller Input Shaft At Rear Of Engine Flywheel Housing
Courtesy of GENERAL MOTORS CORP.

52. Have an assistant guide the front of the driveline during the removal of the driveline from the vehicle.
53. SLOWLY lower the driveline, while simultaneously adjusting the angle of tilt and pulling the driveline away from the engine UNTIL the propeller input shaft at the front of the driveline support assembly just clears the engine flywheel housing.
54. SLOWLY lower the driveline completely out of the vehicle.

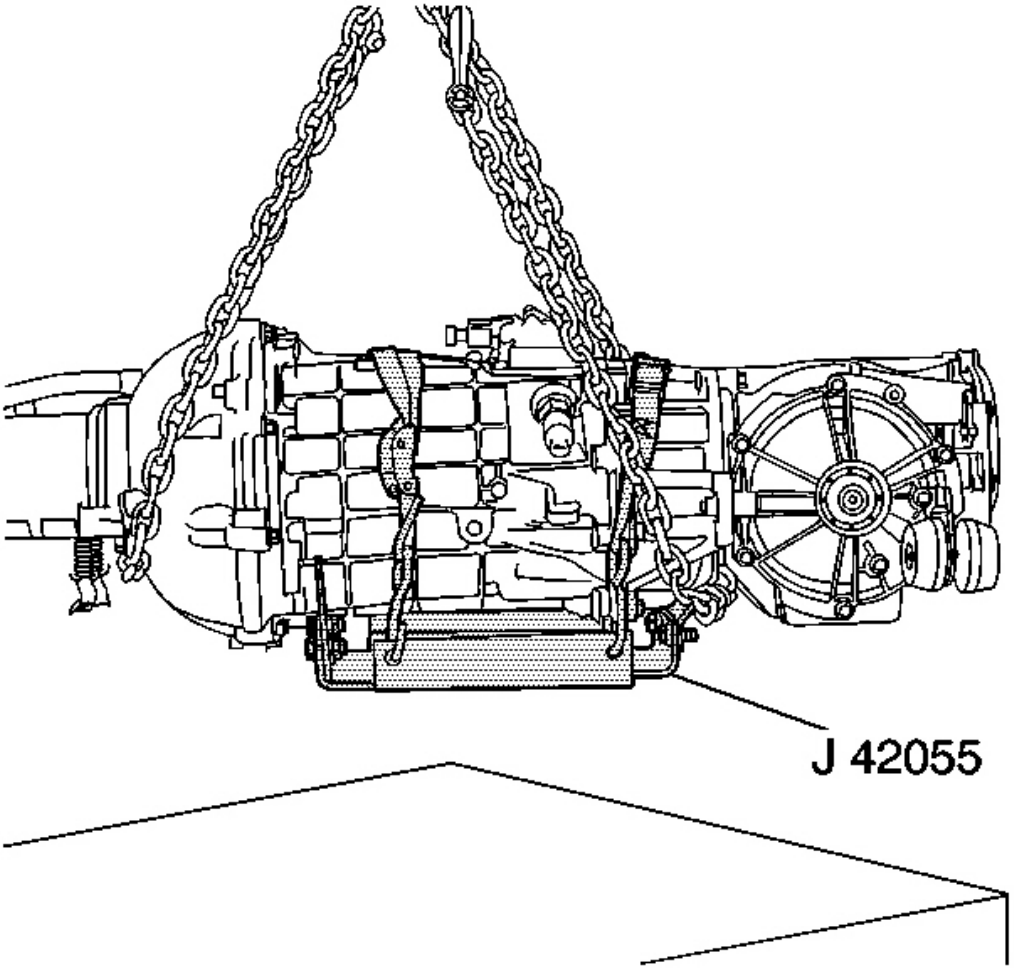


Fig. 151: Rear Exhaust Hangers At Driveline Support Assembly
Courtesy of GENERAL MOTORS CORP.

55. Position the chainfall, or equivalent, of a lift device in a way which will protect the rear exhaust hangers located on the driveline support assembly.
56. Using the lift device, raise the driveline to relieve the weight from the transmission jack.
57. Disconnect the **J 42055** from the transmission jack ONLY; the **J 42055** will provide stability to the driveline components while working on a bench.
58. Position the driveline on a workbench with the lift device still attached.
59. Support the driveline support assembly and the differential for additional balance.

60. Remove the lift device from the driveline.

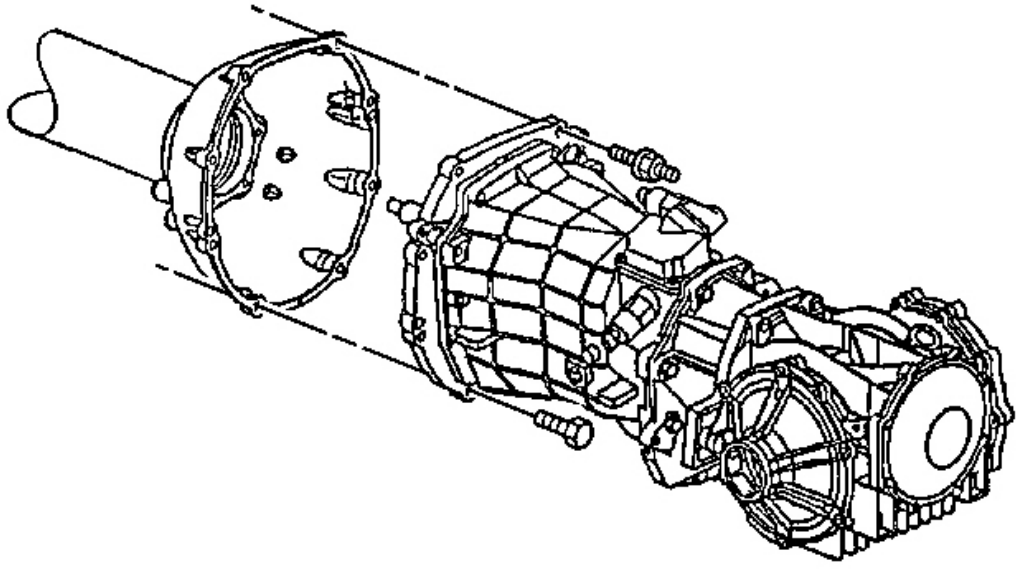


Fig. 152: Transmission To Driveline Support Assembly Bolts/Studs
Courtesy of GENERAL MOTORS CORP.

61. Remove the transmission to driveline support assembly bolts/studs.
62. Insert a flat bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the transmission, then begin to pry the driveline support assembly loose from the transmission.

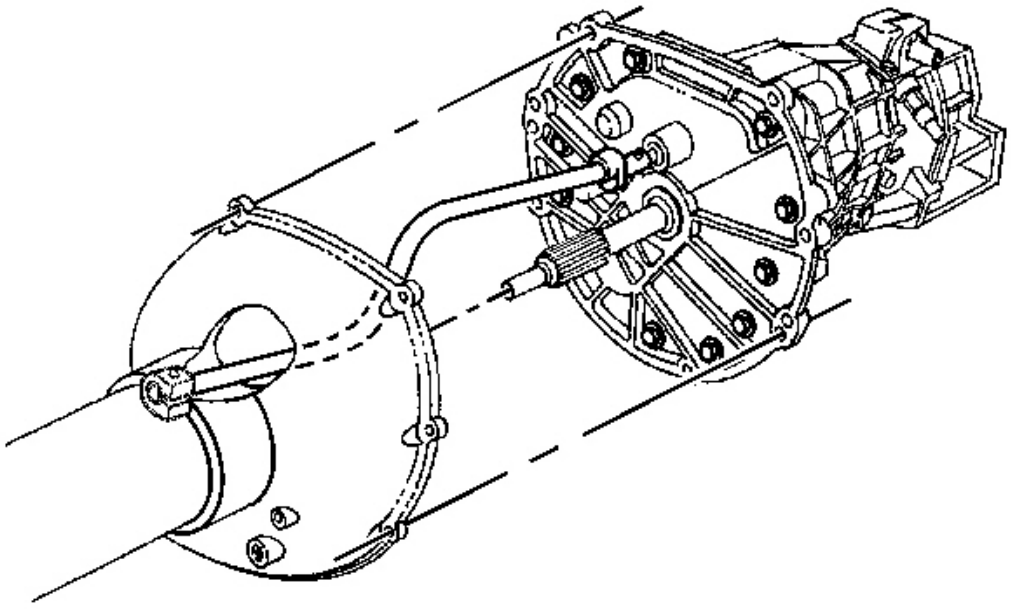


Fig. 153: Driveline Support Assembly To Transmission Shift Rod
Courtesy of GENERAL MOTORS CORP.

63. Slowly slide the driveline support assembly away from the transmission while guiding the transmission shift rod through the opening in the driveline support assembly.

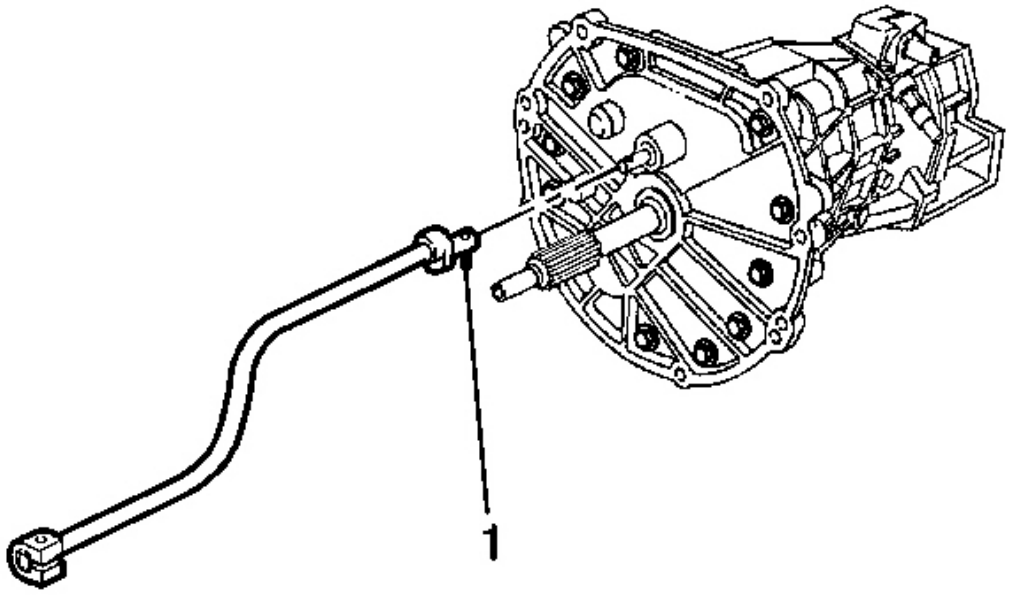


Fig. 154: Roll Pin, Transmission Shift Rod & Transmission Shift Shaft
Courtesy of GENERAL MOTORS CORP.

64. Using a drift or punch, remove the roll pin (1) retaining the transmission shift rod to the transmission shift shaft.
65. Remove the transmission shift rod.

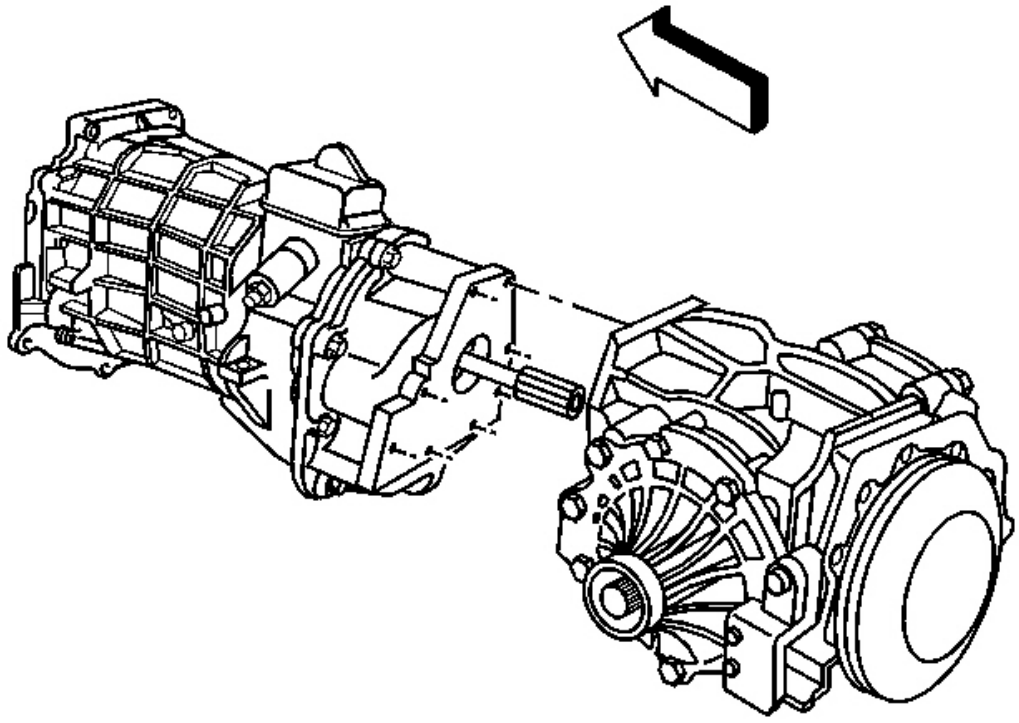


Fig. 155: Differential, Transmission Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

66. Remove the differential to transmission bolts and nuts.
67. SLOWLY slide the differential from the transmission.
68. Remove the transmission from the **J 42055** , if necessary.

Installation Procedure

NOTE: When tilting down the rear of the driveline, insert a putty knife or similar tool between the shift control bracket on the driveline support assembly and the brake pipe retainer on the driveline tunnel wall to prevent damage.

NOTE: Ensure that the clutch hydraulic hoses are positioned away from nearby vehicle components or vehicle damage may result.

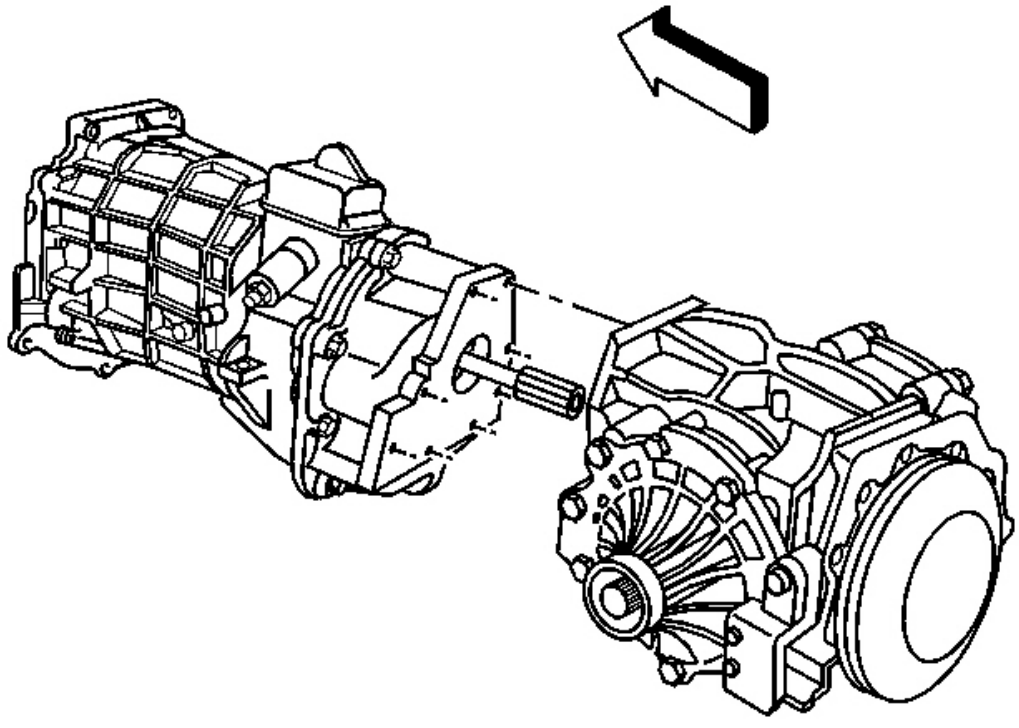


Fig. 156: Differential, Transmission Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the transmission to the **J 42055** , if removed.
2. SLOWLY slide the differential to the transmission.

NOTE: Refer to Fastener Notice .

3. Install the differential to transmission bolts and nuts.

Tighten: Tighten the differential to transmission bolts and nuts to 50 N.m (37 lb ft).

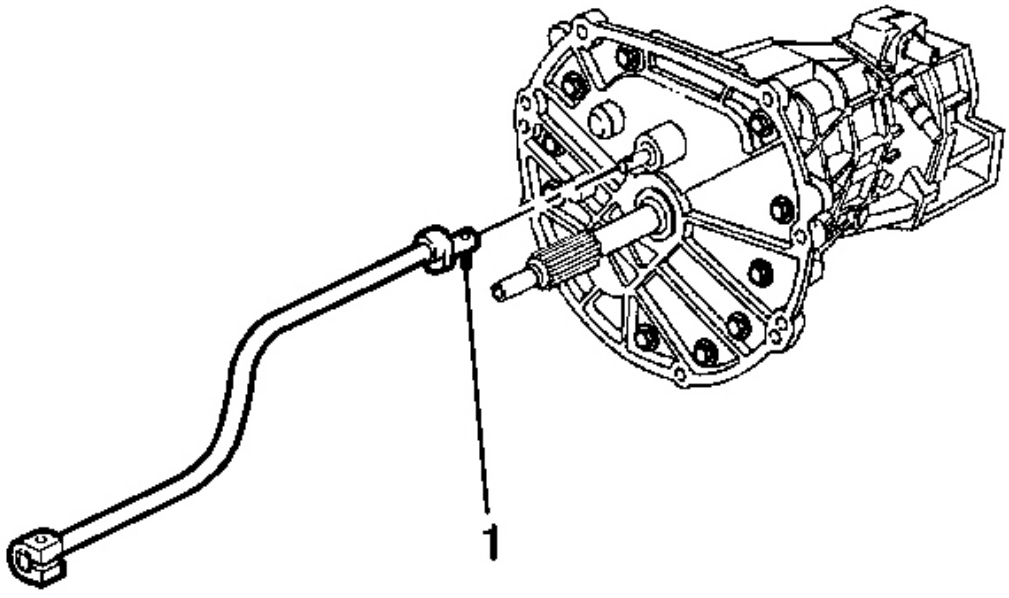


Fig. 157: Roll Pin, Transmission Shift Rod & Transmission Shift Shaft
Courtesy of GENERAL MOTORS CORP.

4. Install the transmission shift rod to the transmission shift shaft.
5. Using a drift or punch, install the roll pin (1) to retain the transmission shift rod to the shift shaft.

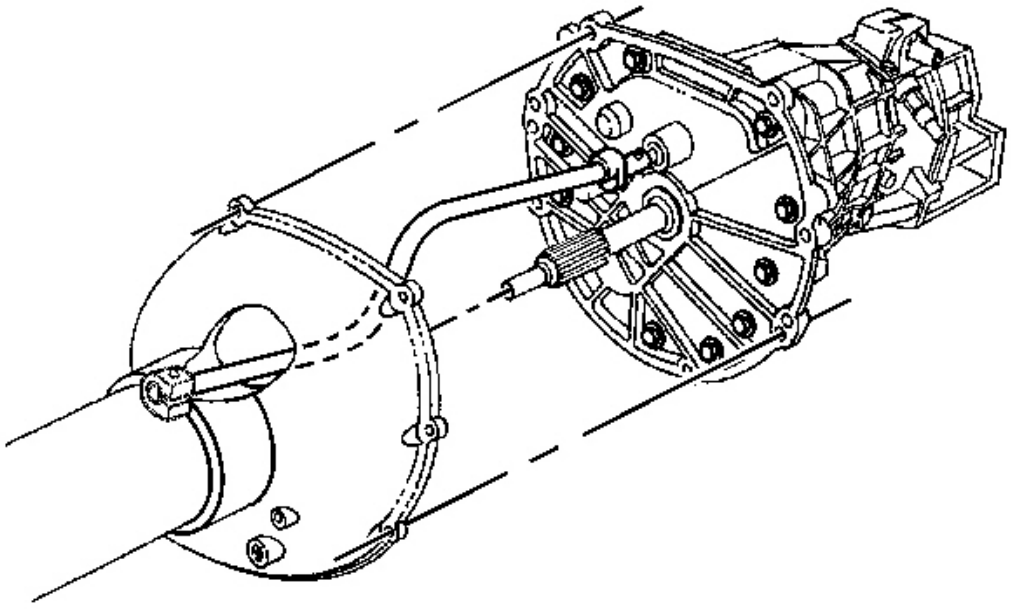


Fig. 158: Driveline Support Assembly To Transmission Shift Rod
Courtesy of GENERAL MOTORS CORP.

6. Slowly slide the driveline support assembly to the transmission, while guiding the transmission shift rod through the opening in the driveline support assembly.

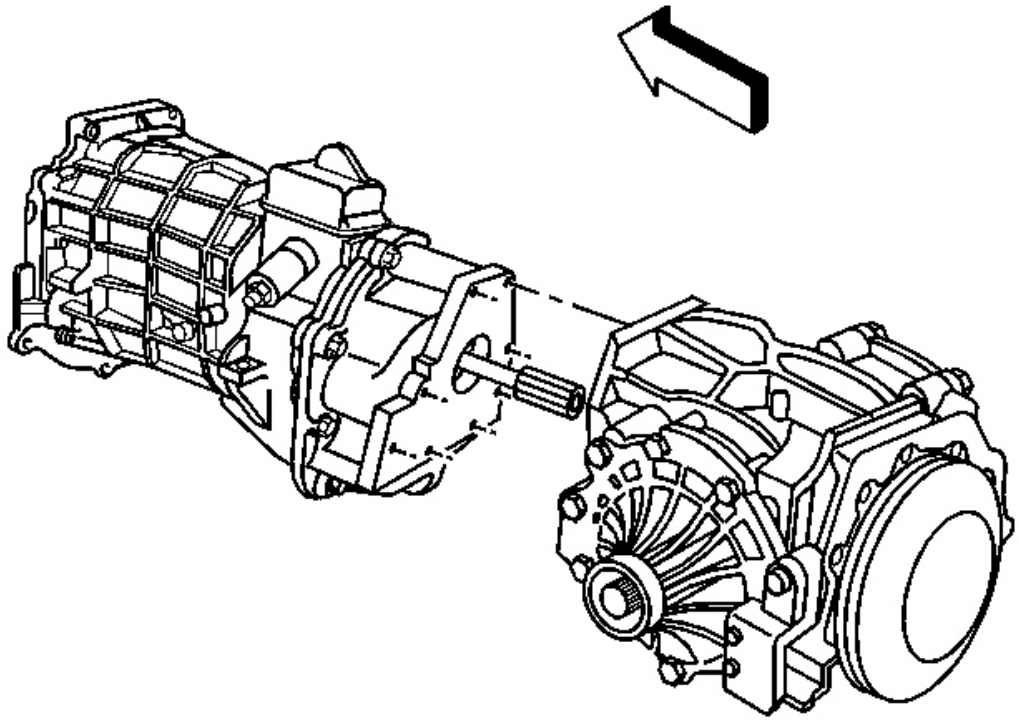


Fig. 159: Differential, Transmission Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

7. Install the transmission to driveline support assembly bolts/studs.

   Tighten: Tighten the transmission to driveline support assembly bolts/studs to 50 N.m (37 lb ft).

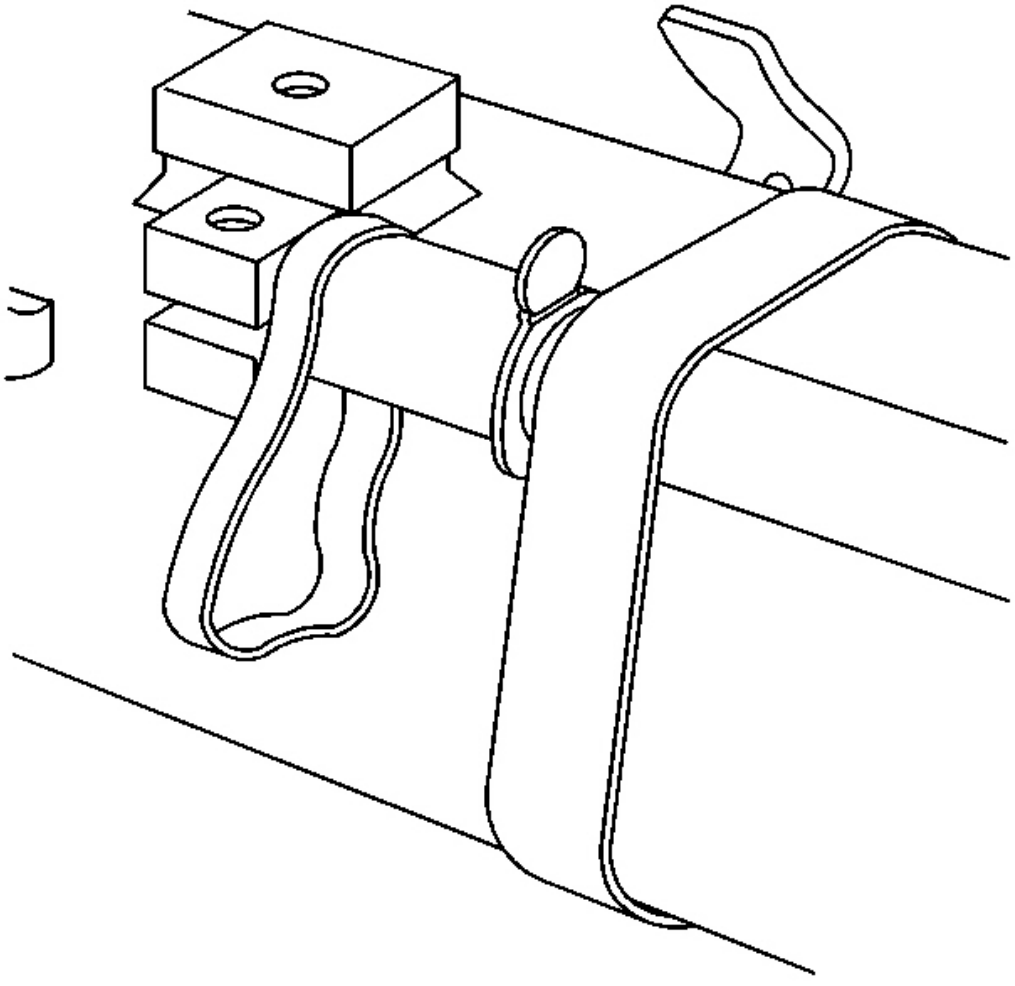


Fig. 160: Rubber Band To Transmission Shift Rod
Courtesy of GENERAL MOTORS CORP.

8. Loosely install a rubber band onto the transmission shift rod and position just behind the shift rod clamp.

   (The rubber band will be used to aid in installing the shift control assembly after the driveline has been installed.)

9. Using a piece of masking tape, or similar tape which can be easily broken, affix the transmission shift rod to the driveline support assembly and position the rod just to the

outside of the mounting boss used for the shift control.

(The tape is intended to keep the shift rod in position to aid in shift control installation after the driveline has been installed.)

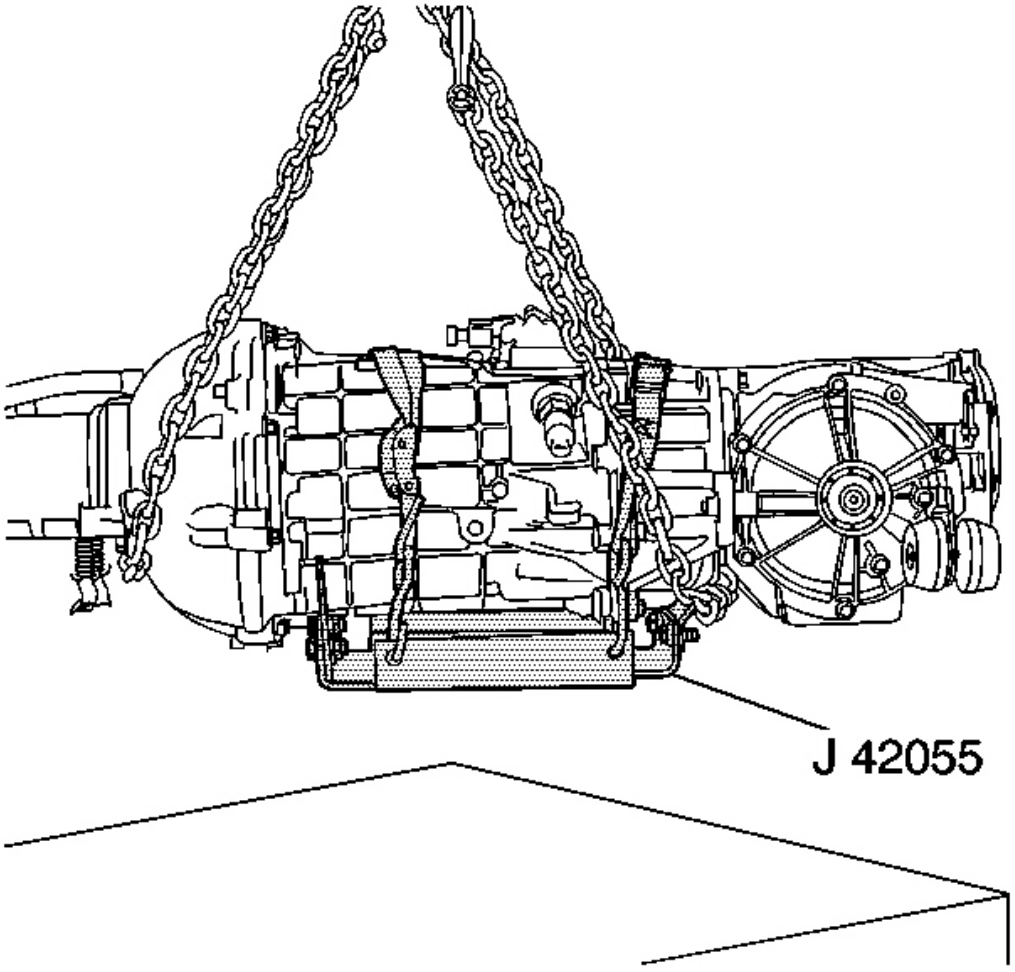


Fig. 161: Rear Exhaust Hangers At Driveline Support Assembly
Courtesy of GENERAL MOTORS CORP.

10. Position the chainfall, or equivalent, of a lift device in a way which will protect the rear exhaust hangers located on the driveline support assembly.

IMPORTANT: The aid of an assistant will be necessary for the following steps until the driveline is installed into the vehicle.

11. Using the lift device, raise the driveline off the workbench and position the driveline with the **J 42055** onto a transmission jack.
12. Connect the **J 42055** to the transmission jack.

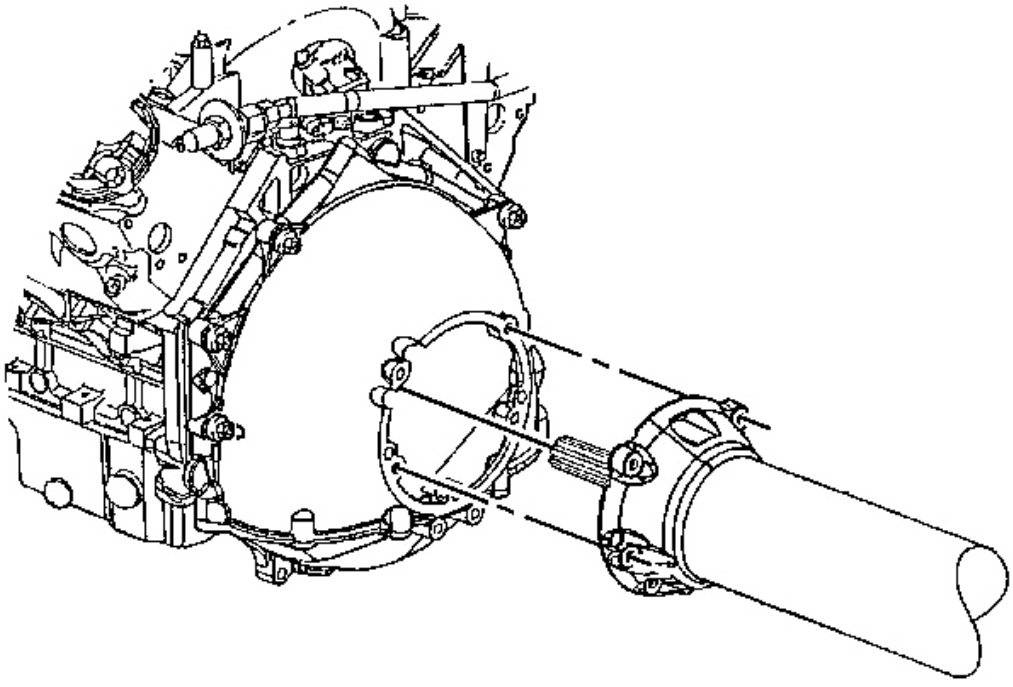


Fig. 162: Propeller Input Shaft At Rear Of Engine Flywheel Housing
Courtesy of GENERAL MOTORS CORP.

13. Remove the lift device from the driveline.
14. Position the driveline under the vehicle.
15. Begin to raise the driveline at the approximate angle used during removal.
16. Position the wiring harness along the driveline support assembly and LOOSELY install the harness into the harness retaining slots.
17. Have an assistant guide the front of the driveline so the propeller input shaft is just to the rear of the engine flywheel housing, then raise the driveline to the PROPER HEIGHT and

the PROPER ANGLE to install to the engine.

18. Have an assistant begin to insert the propeller input shaft into the clutch driven plate hub while maintaining the proper angle of the driveline; if necessary, use a screwdriver to rotate the shaft slightly to bring the splines into alignment.

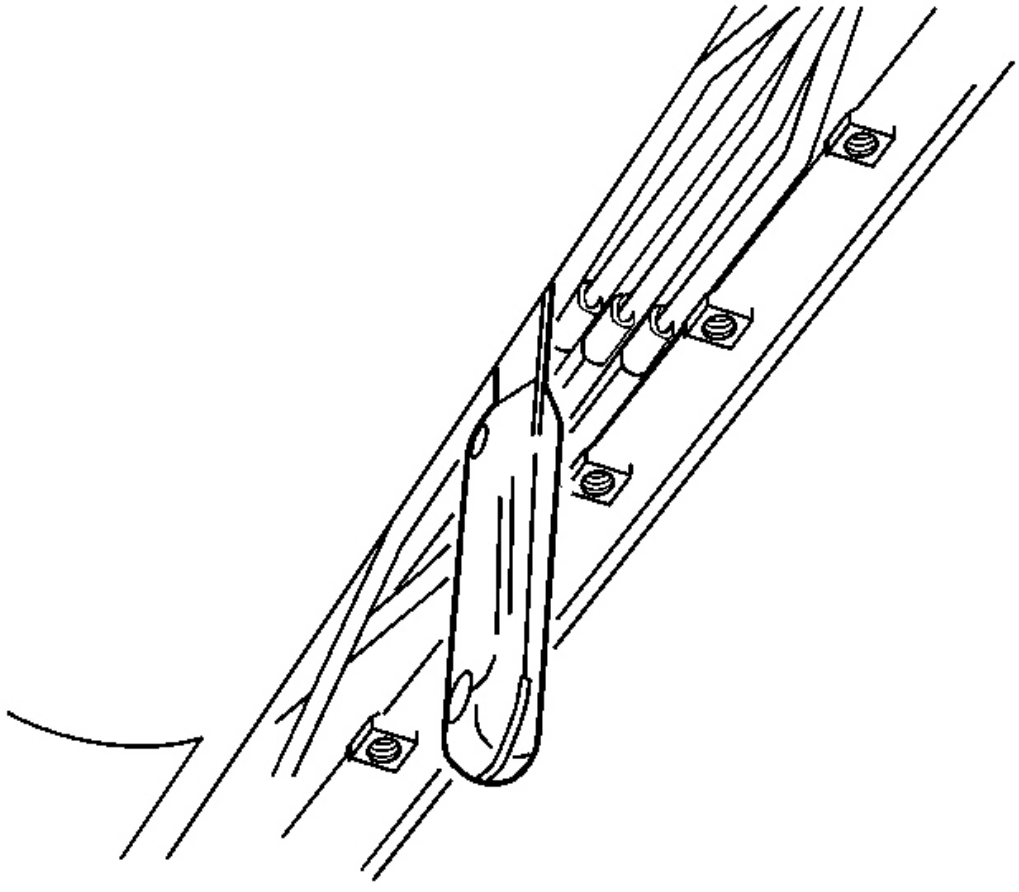


Fig. 163: Edge Of Shifter Bracket On Side Of Driveline Support Assembly & Brake Pipe Retainer
Courtesy of GENERAL MOTORS CORP.

19. Insert a putty knife, or similar tool, between the edge of the shifter bracket on the side of the driveline support assembly and the brake pipe retainer on the wall of the driveline tunnel.

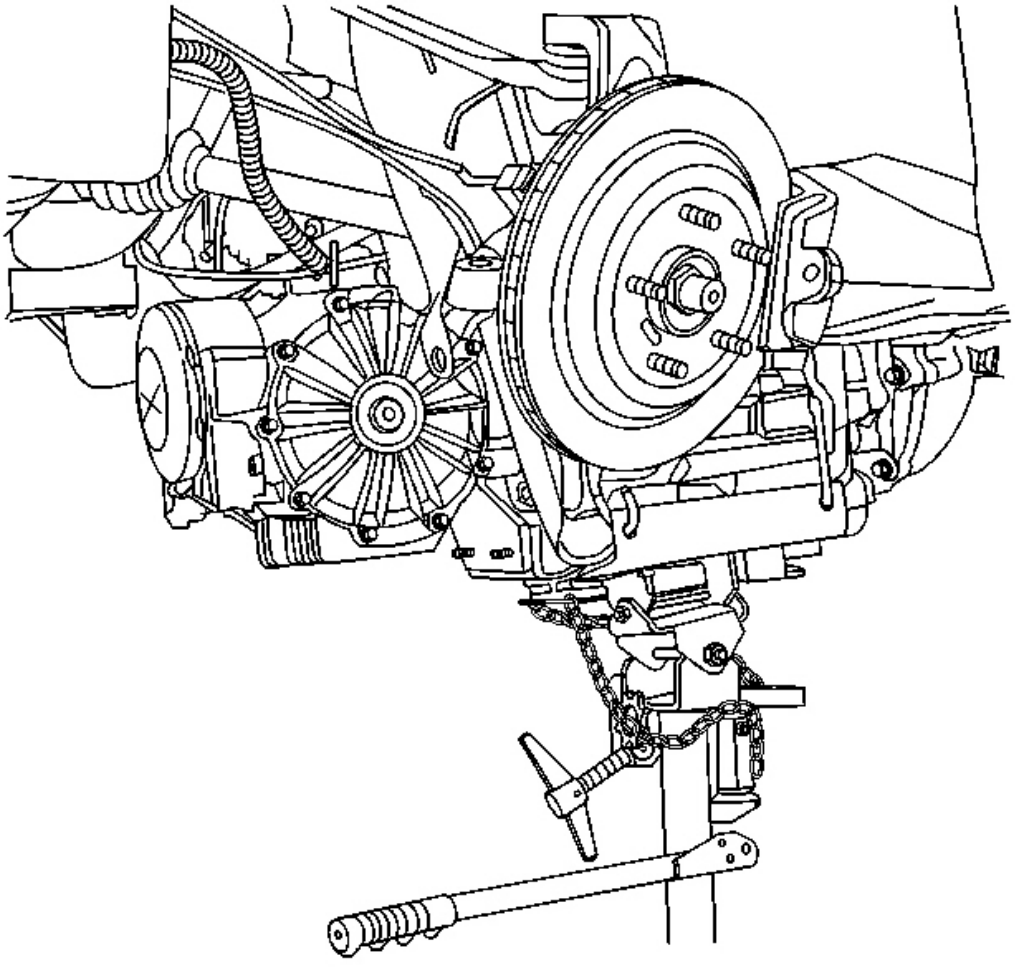


Fig. 164: Wiring Harness To Harness Retainer At Top Of Transmission
Courtesy of GENERAL MOTORS CORP.

20. SLOWLY seat the driveline to the engine flywheel housing while maintaining the proper angle of the driveline.
21. Reposition the wiring harness bracket from near the driveline tunnel wall to align with the appropriate driveline support assembly bolt hole.

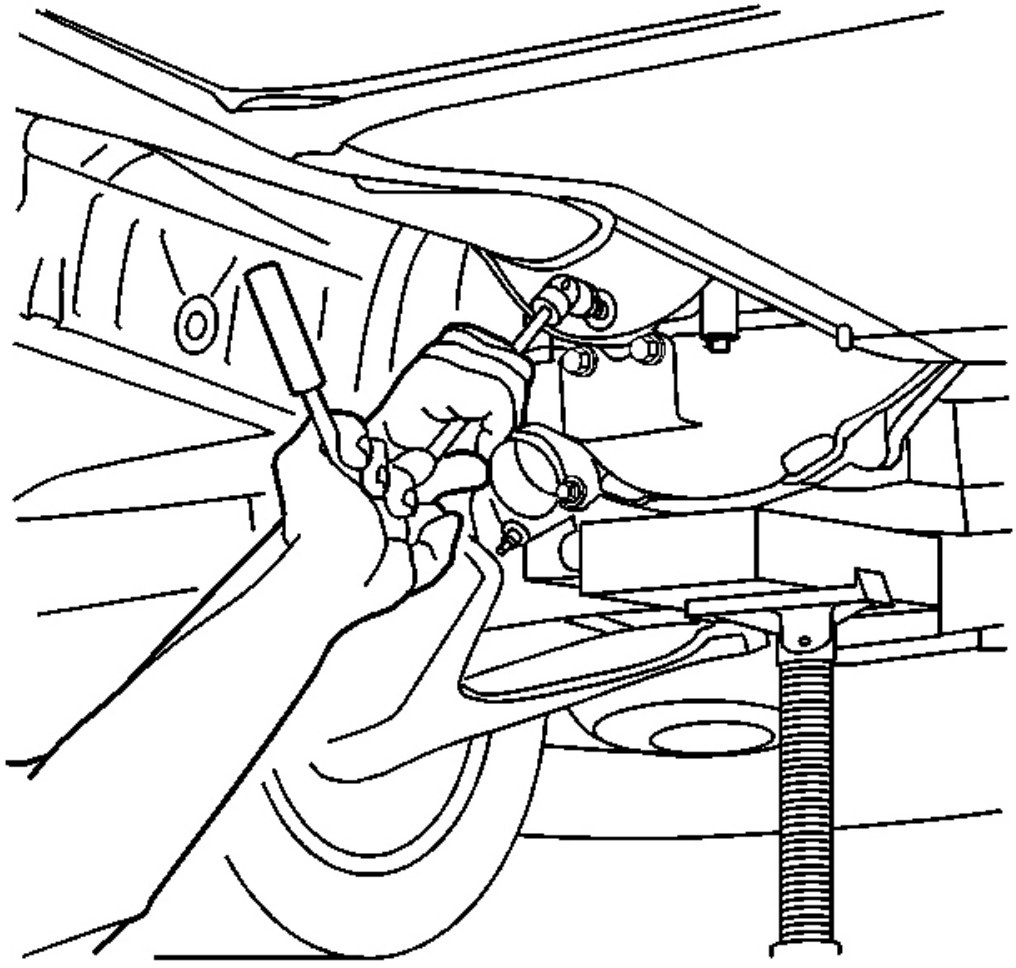


Fig. 165: Driveline Support Assembly To Engine Flywheel Housing Bolts
Courtesy of GENERAL MOTORS CORP.

22. Install the five driveline support assembly to engine flywheel housing bolts.

    Tighten: Tighten the driveline support assembly to engine flywheel housing bolts to 50 N.m (37 lb ft).

23. Install the wiring harness to the wiring harness retainer along the top of the transmission.
24. SLOWLY raise the driveline to approximately 5 cm (2 in) BELOW the final installed height.

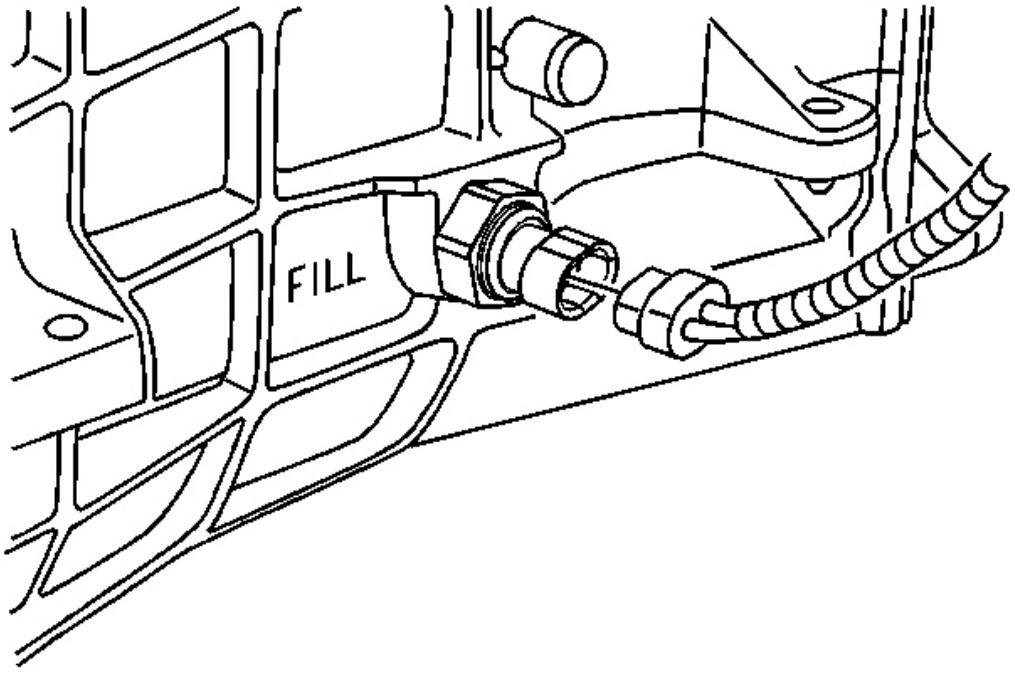


Fig. 166: Transmission Fluid Temperature Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

25. Connect the transmission fluid temperature sensor electrical connector, if equipped.

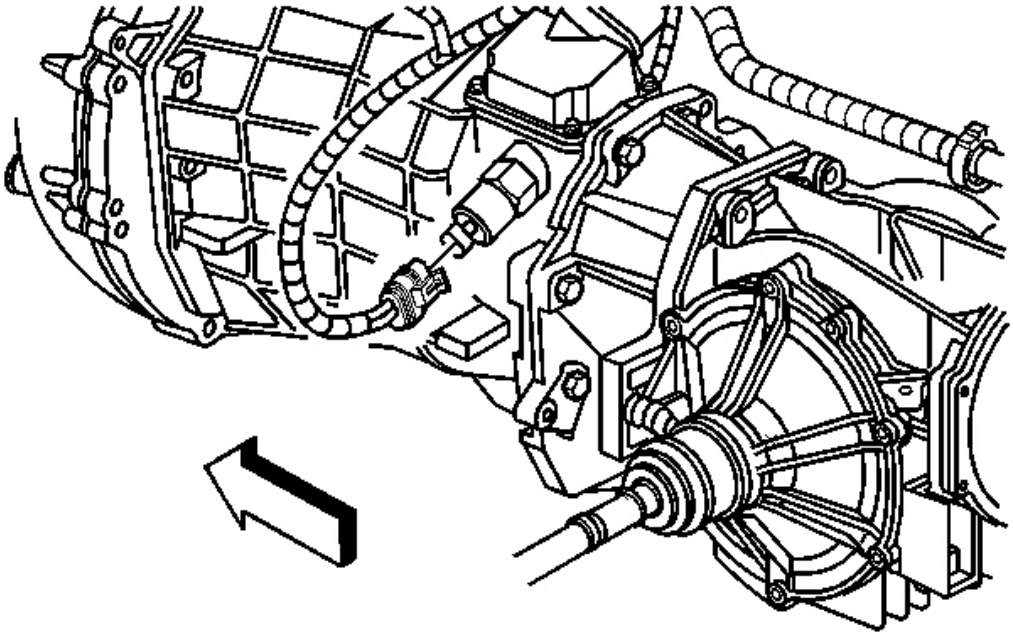


Fig. 167: Gear Select (Skip Shift) Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

26. Connect the gear select (skip shift) solenoid electrical connector.

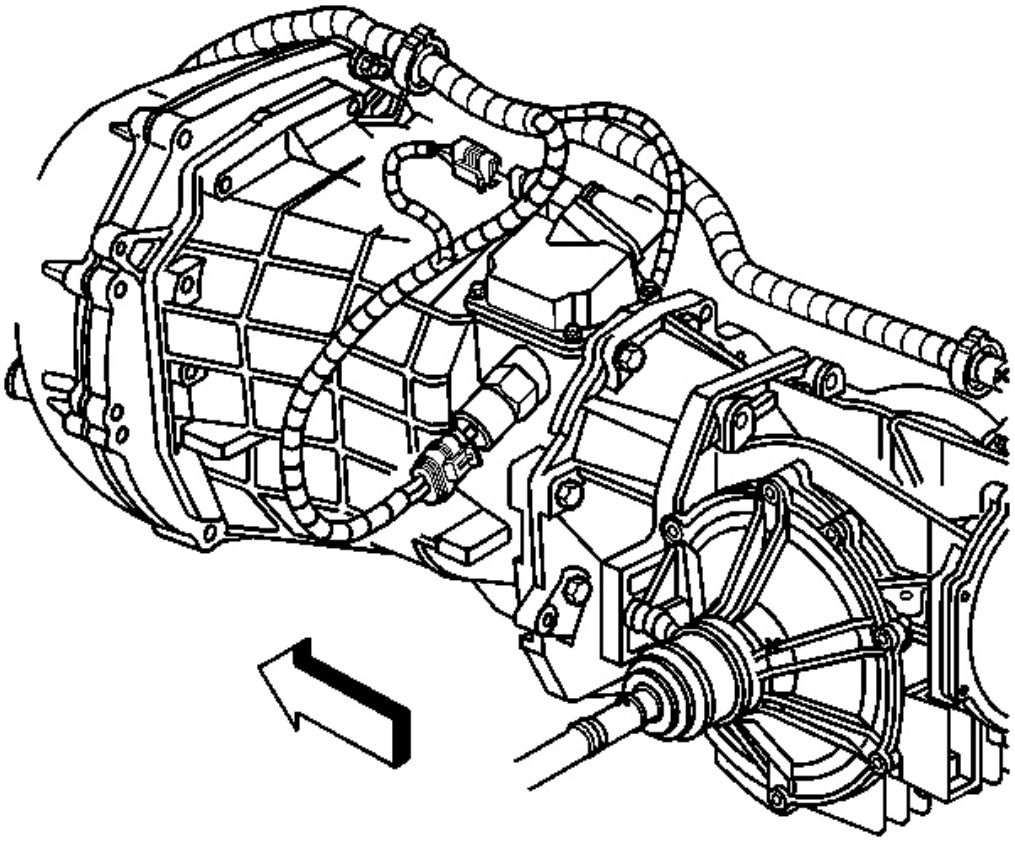


Fig. 168: Reverse Lockout Solenoid Electrical Connector
Courtesy of GENERAL MOTORS CORP.

27. Connect the reverse lockout solenoid electrical connector.

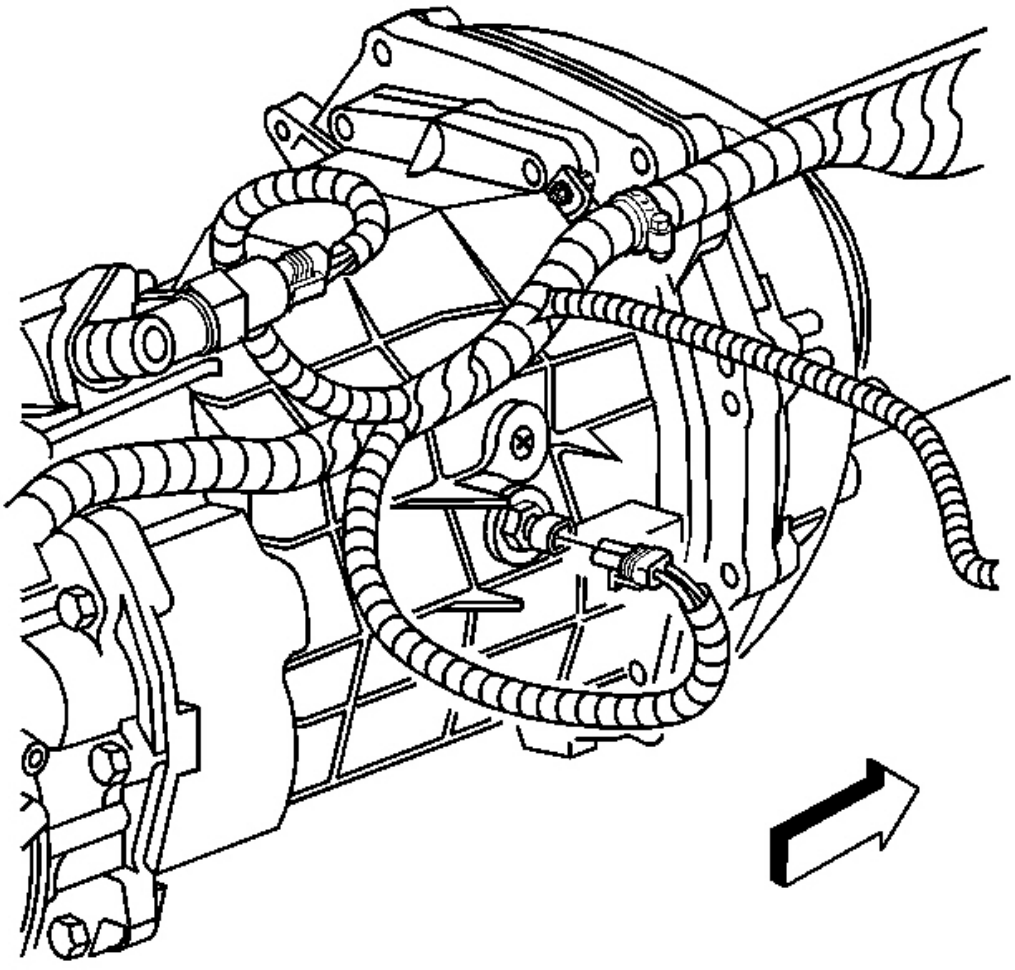


Fig. 169: Backup Lamp Switch Electrical Connector
Courtesy of GENERAL MOTORS CORP.

28. Connect the backup lamp switch electrical connector.

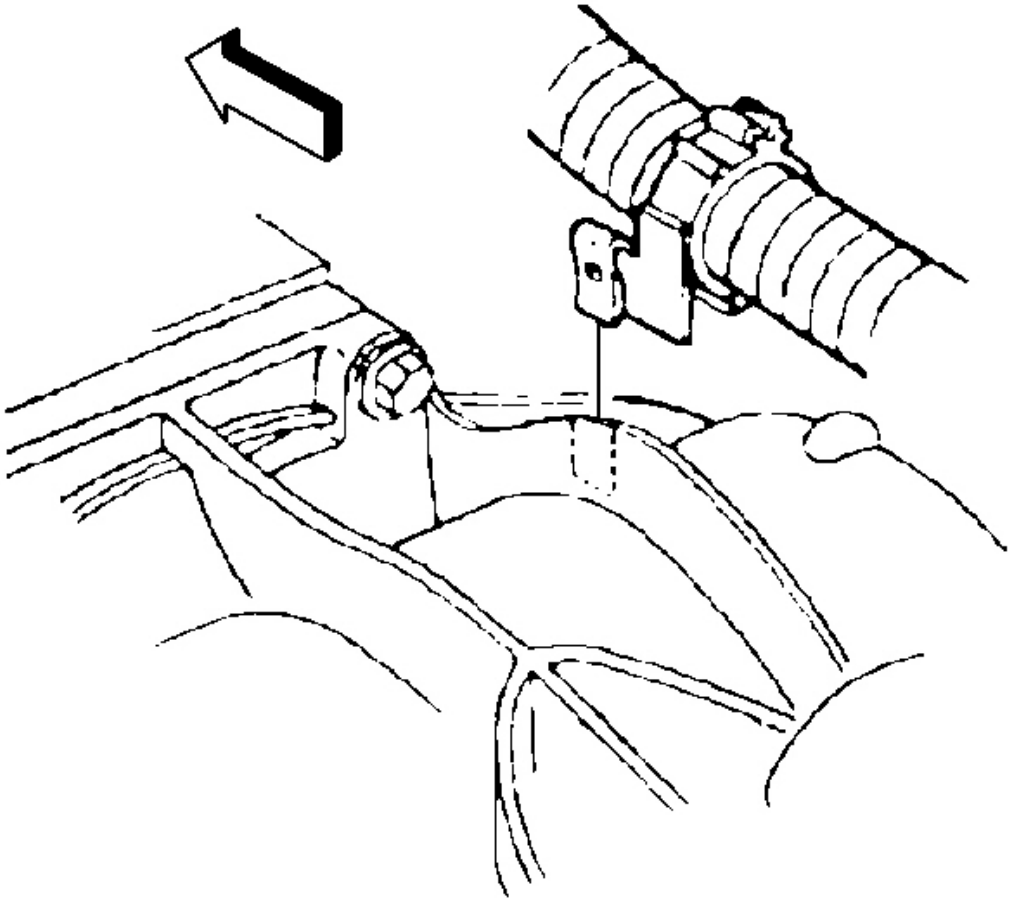


Fig. 170: Wiring Harness Retainer To Stud At Differential Rear Cover
Courtesy of GENERAL MOTORS CORP.

29. Connect the wiring harness clip to the top of the differential.
30. Connect the wiring harness retainer to the stud at the differential rear cover.

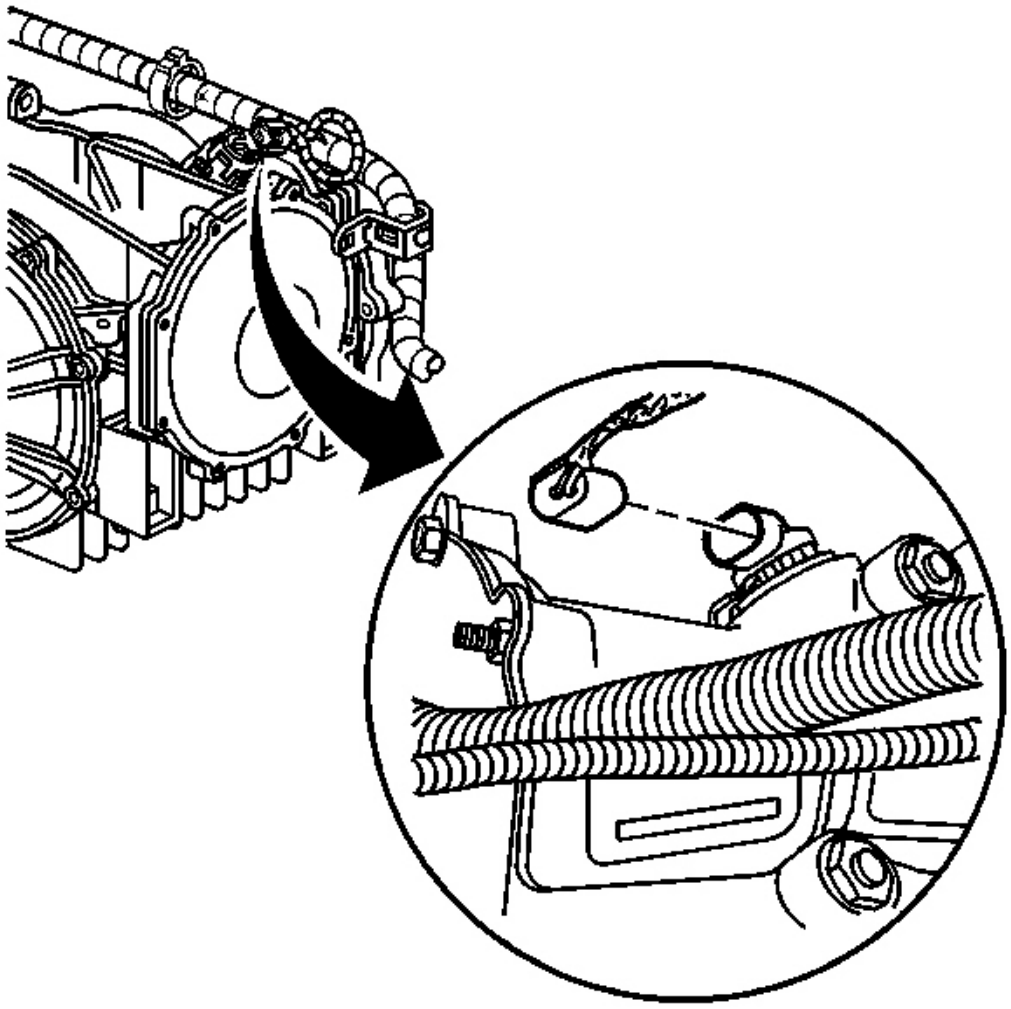


Fig. 171: Vehicle Speed Sensor (VSS) Electrical Connector
Courtesy of GENERAL MOTORS CORP.

31. Connect the vehicle speed sensor (VSS) electrical connector.
32. Slowly raise the driveline to final installation height.
33. Remove the putty knife, if still in position.
34. Remove the jack which supported the rear of the engine.
35. Remove the tie-off retainers from the axle shafts.
36. CAREFULLY align and seat the axle shafts to the differential.

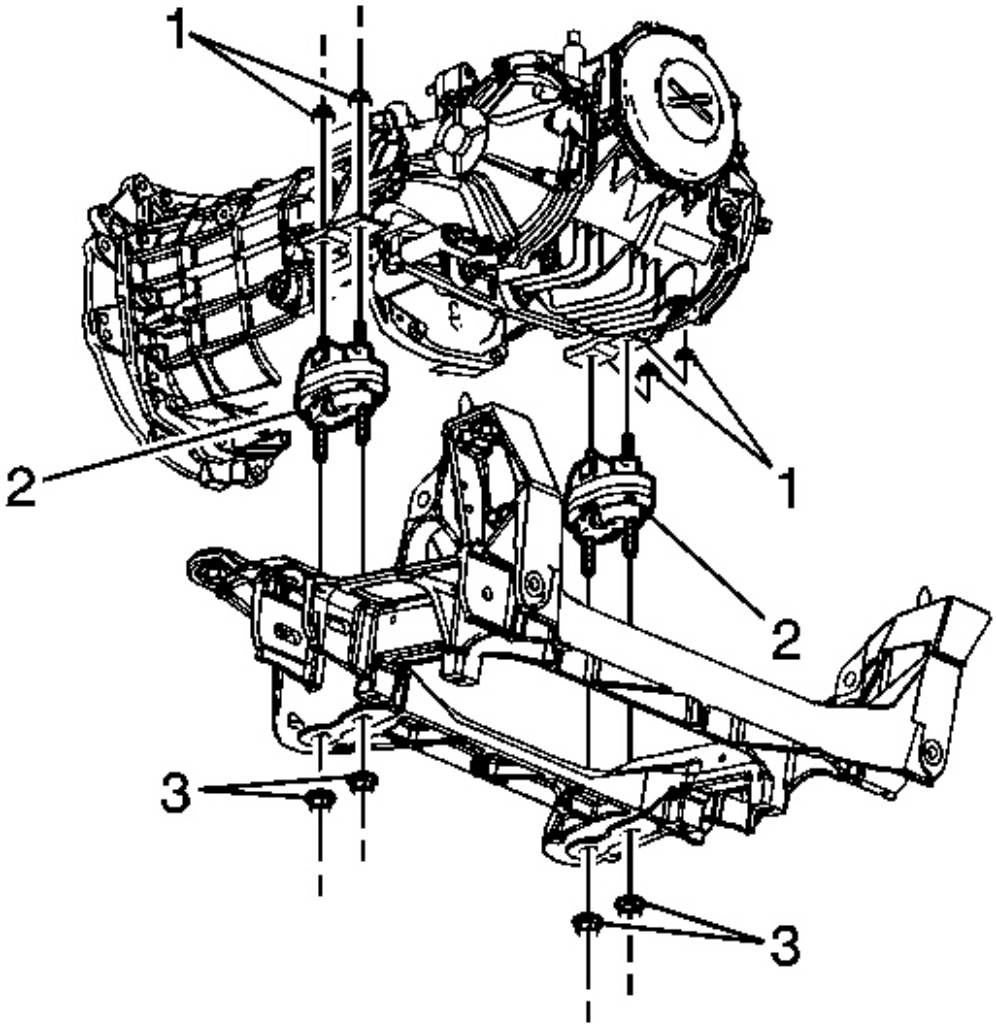


Fig. 172: View Of Transaxle Mounts & Nuts
Courtesy of GENERAL MOTORS CORP.

37. Install the transaxle mount (2) to the differential.
38. Install the transaxle mount nuts (1).

Tighten: Tighten the transaxle mount nuts to 50 N.m (37 lb ft).

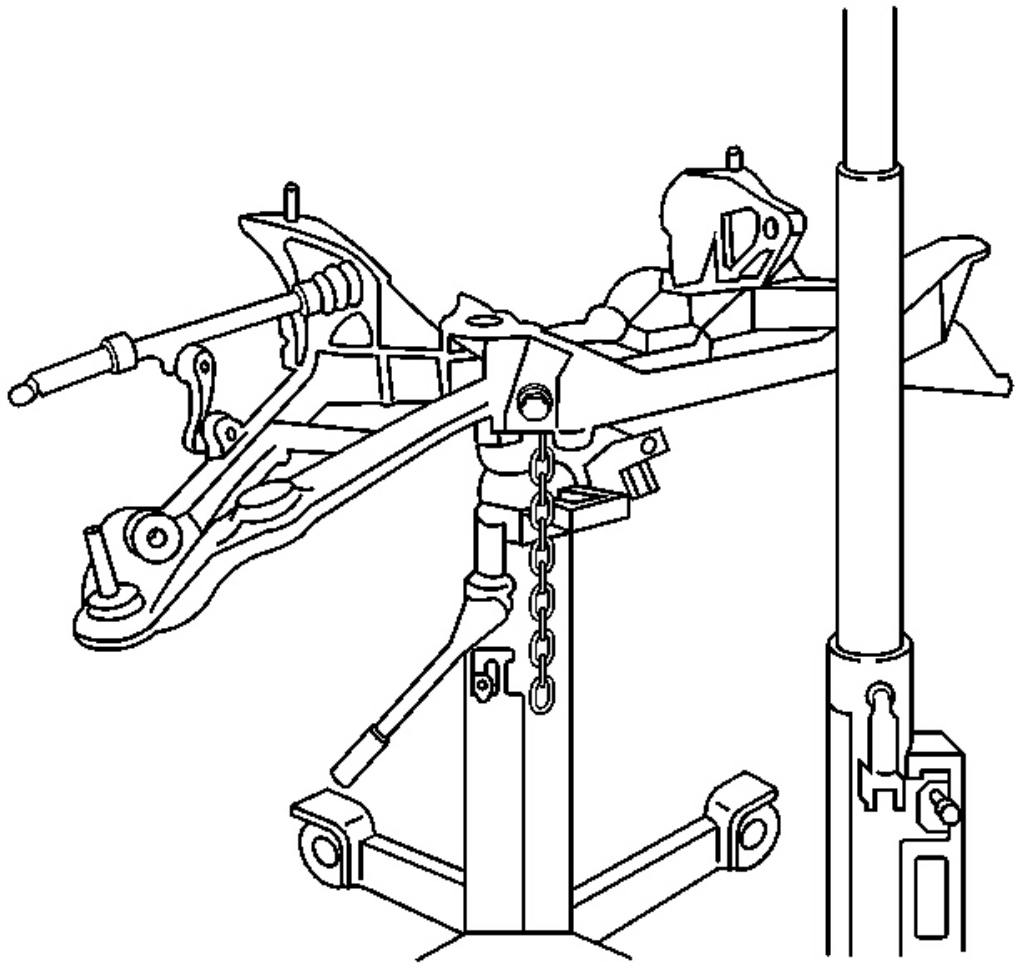


Fig. 173: View Of Rear Suspension Crossmember
Courtesy of GENERAL MOTORS CORP.

39. With the aid of an assistant, begin to raise the rear suspension crossmember (still firmly attached to a transmission jack), to the vehicle frame rails.
40. Guide the rear suspension crossmember alignment pins into the alignment holes in the vehicle frame rails, and guide the transaxle mount studs into the mounting holes in the crossmember, then raise the crossmember to seat to the frame rails.

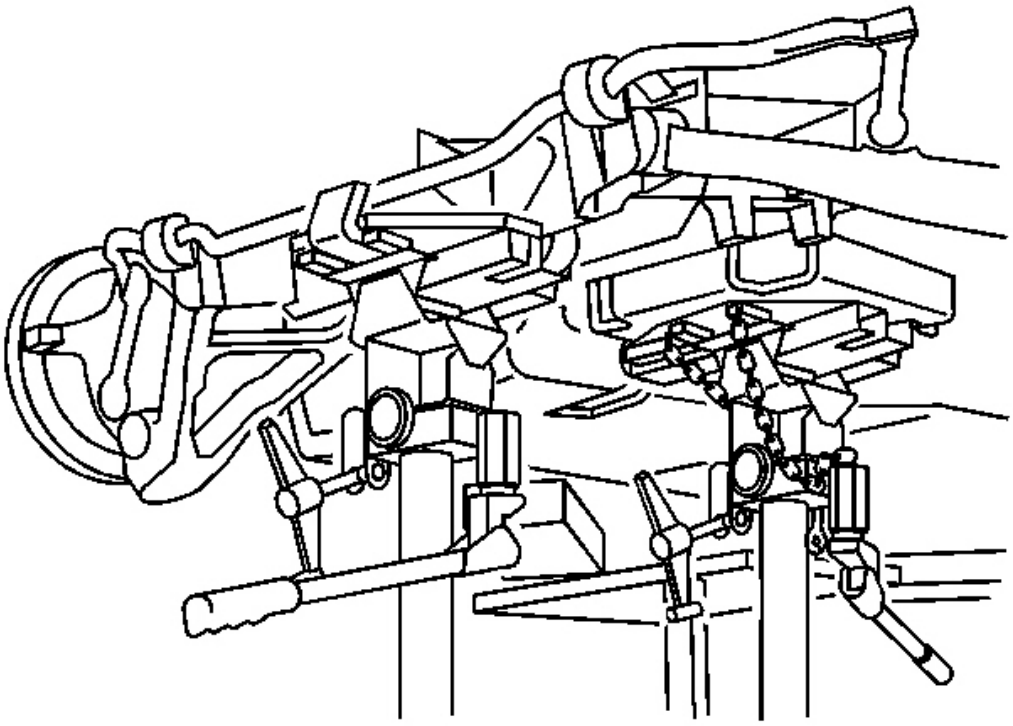


Fig. 174: View Of Correct Transmission Jack Placement
Courtesy of GENERAL MOTORS CORP.

41. Using ONLY HAND TOOLS, install NEW rear suspension crossmember mounting nuts.

    Tighten: Tighten the rear suspension crossmember mounting nuts to 110 N.m (81 lb ft).

42. Remove the transmission jack from the rear suspension crossmember.
43. Release the **J 42055** from the transmission, then remove the **J 42055** and transmission jack.

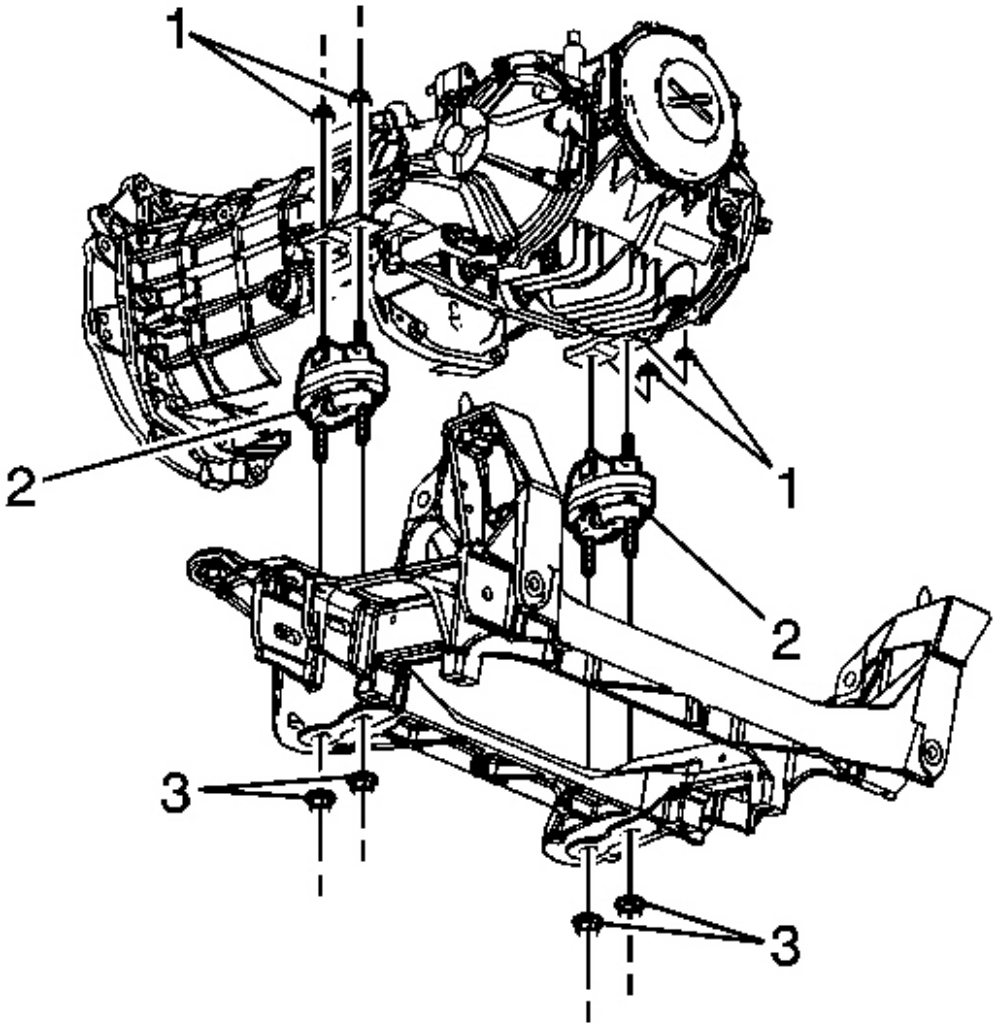


Fig. 175: View Of Transaxle Mounts & Nuts
Courtesy of GENERAL MOTORS CORP.

44. Install the transaxle mount (2) to rear suspension crossmember nuts (3).

    Tighten: Tighten the transaxle mount to rear suspension crossmember nuts to 50 N.m (37 lb ft).

45. Install the differential to transmission lower nut.

Tighten: Tighten the differential to transmission lower nut to 50 N.m (37 lb ft).

46. Connect the wiring harness and brake pipe clip retainers to the rear suspension crossmember.

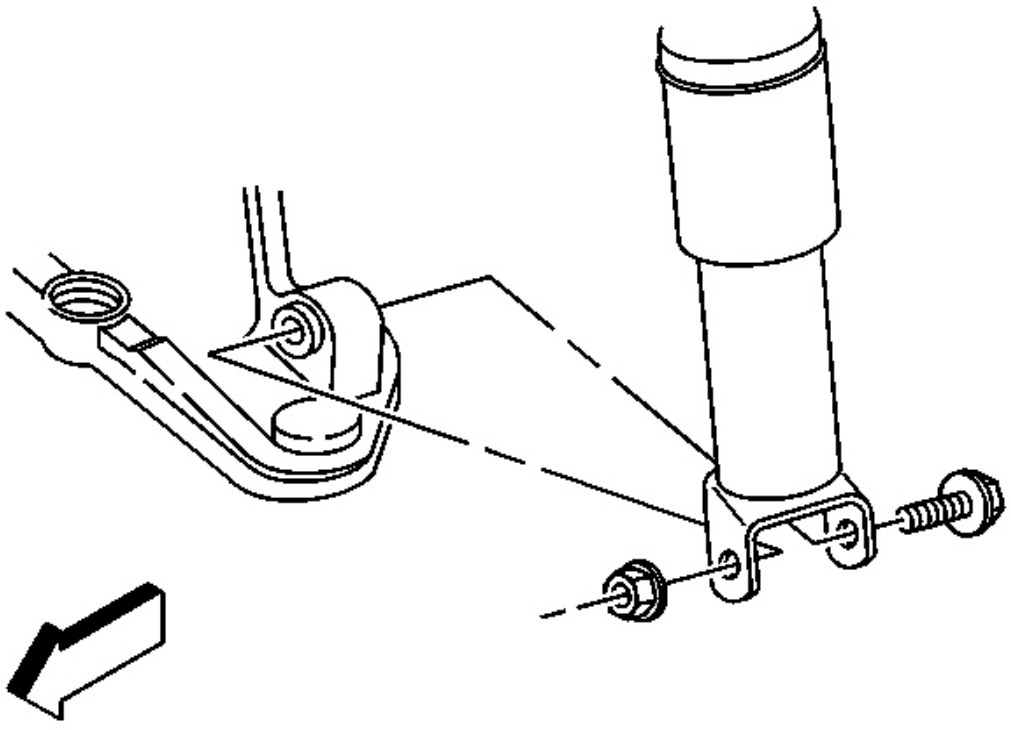


Fig. 176: View Of Shock Absorber Mounting To Control Arm
Courtesy of GENERAL MOTORS CORP.

47. Support the lower control arm with a straight jack.
48. Connect the lower ball joint to the suspension knuckle. Refer to **Knuckle Replacement** .
49. Install the shock absorber lower mounting bolt.

Tighten: Tighten the rear shock absorber lower mounting bolt to 220 N.m (162 lb ft).

50. Connect the outer tie rod end to the suspension knuckle. Refer to **Tie Rod Replacement (Inner)** .

51. Remove the straight jack from the suspension control arm.
52. Repeat steps 46 through 50 for the other side of the vehicle.
53. Remove the J 33432-A, transverse spring compressor.

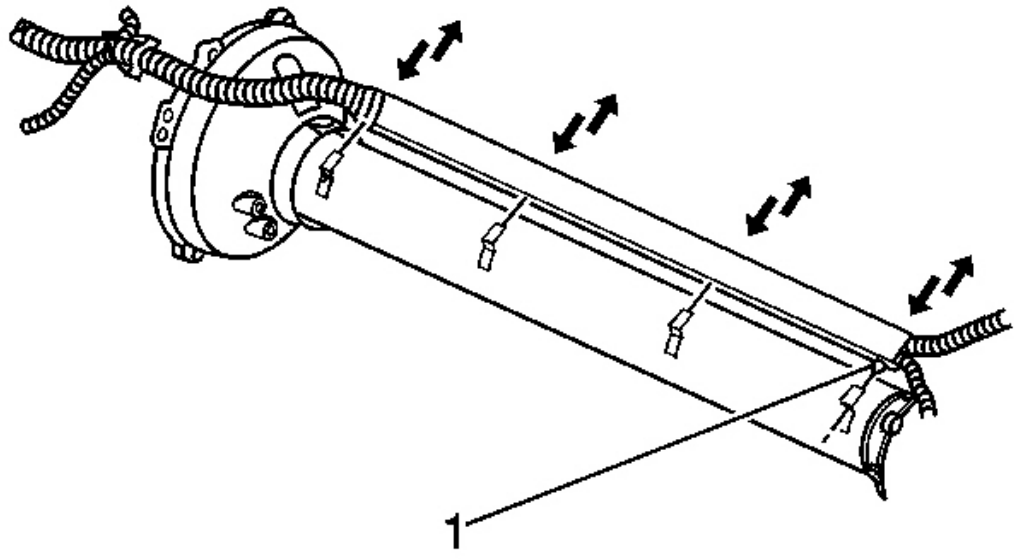


Fig. 177: Wiring Harness To L-Shaped Brackets At Driveline Support Assembly
Courtesy of GENERAL MOTORS CORP.

54. Carefully pull the wiring harness down into the L-shaped brackets along the driveline support assembly, align the harness retainer (locator) (1) to the hole in the forward bracket, then secure in place.

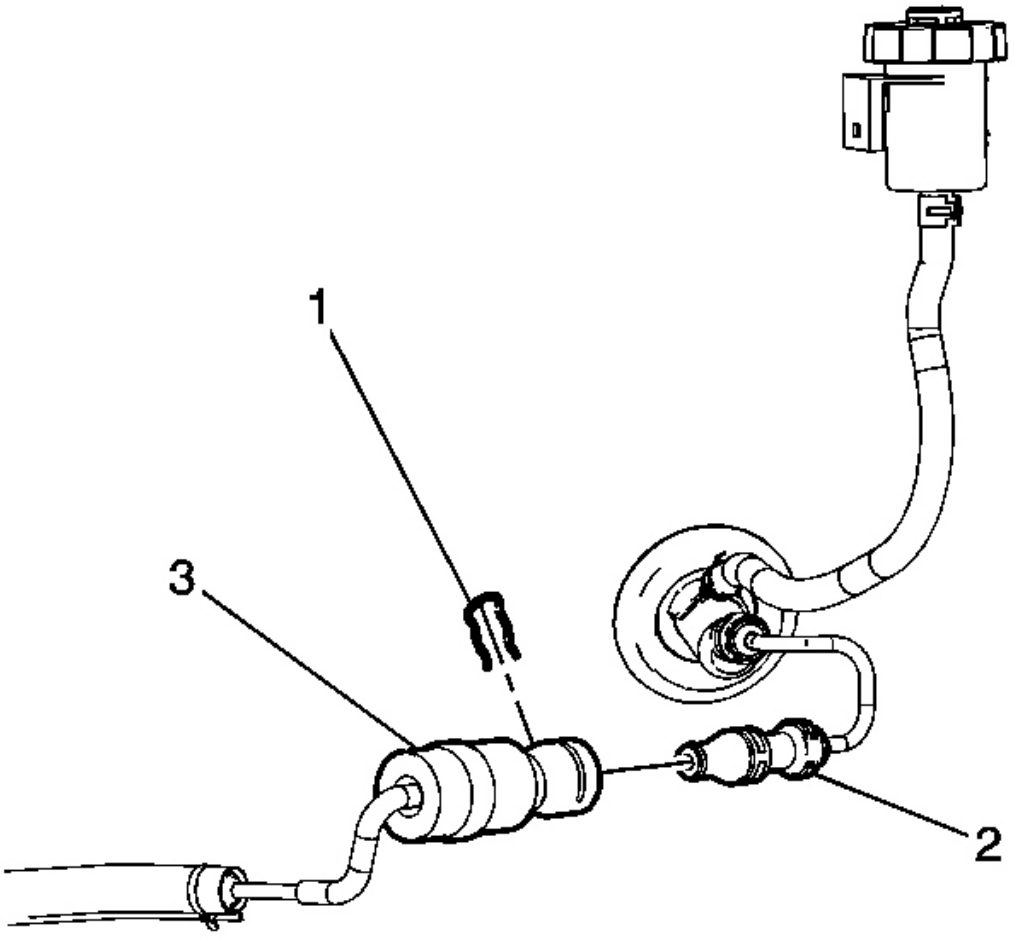


Fig. 178: View Of Clutch Hose, Retaining Clip & Master Cylinder Connection
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: DO NOT rely on an audible click or a visual verification of the clutch hydraulic hose quick connect fitting connection.

55. Install the hose retaining clip (1) then connect the clutch actuator cylinder hose (3) to the clutch master cylinder hose (2).

    Push together the clutch hydraulic hose quick connect fittings, then pull back on the fittings to verify engagement.

56. Check the clutch hydraulic hoses for twists or kinks.
57. Install the clutch actuator cylinder hose to the hose retaining clip below the power brake booster.
58. Install the driveline tunnel closeout panel. Refer to **Driveline Tunnel Closeout Panel Replacement** .
59. Remove the tie-off retainers from the muffler assemblies.
60. Install the intermediate pipe. Refer to **Intermediate Pipe Replacement (6.0L)** or **Intermediate Pipe Replacement (7.0L)** .
61. Install the rear tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .
62. Check and if necessary, add transmission fluid. Refer to **Transmission Fluid Level Inspection**.

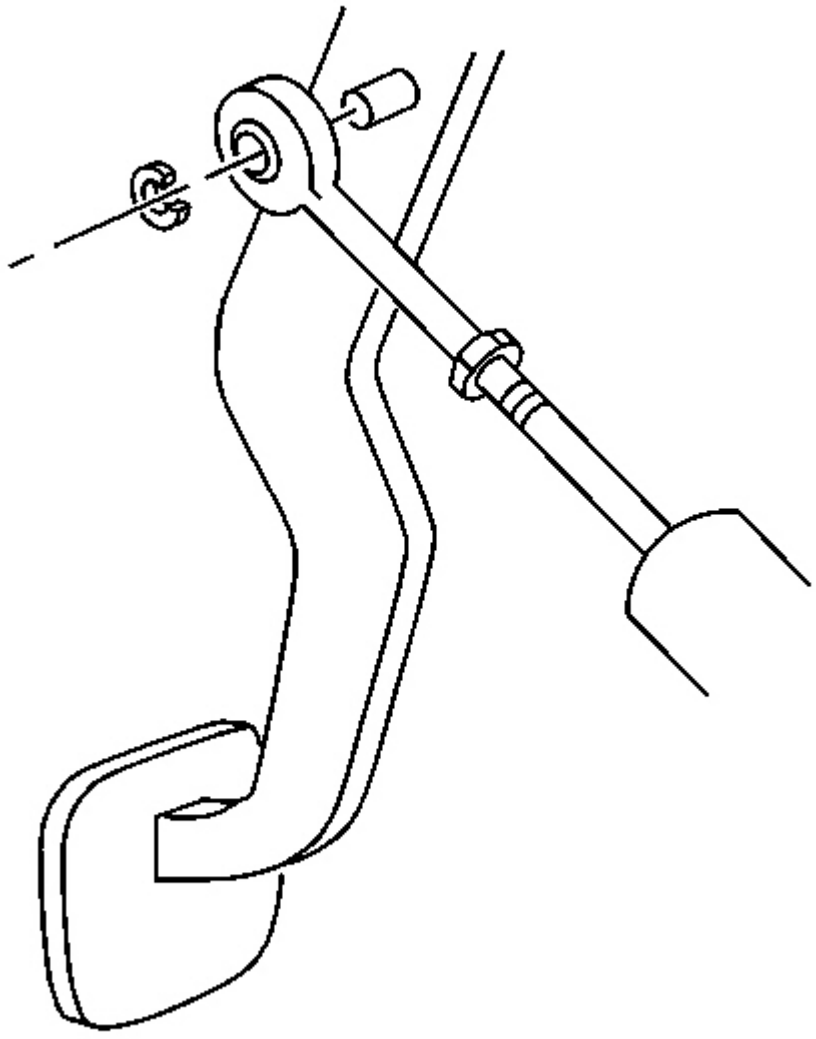


Fig. 179: View Of Master Cylinder Push Rod To Clutch Pedal
Courtesy of GENERAL MOTORS CORP.

63. Lower the vehicle.
64. Connect the clutch master cylinder pushrod to the clutch pedal.
65. Install the clutch master cylinder pushrod retainer.
66. Install the left I/P lower insulator panel. Refer to **Instrument Panel Insulator Panel Replacement** .

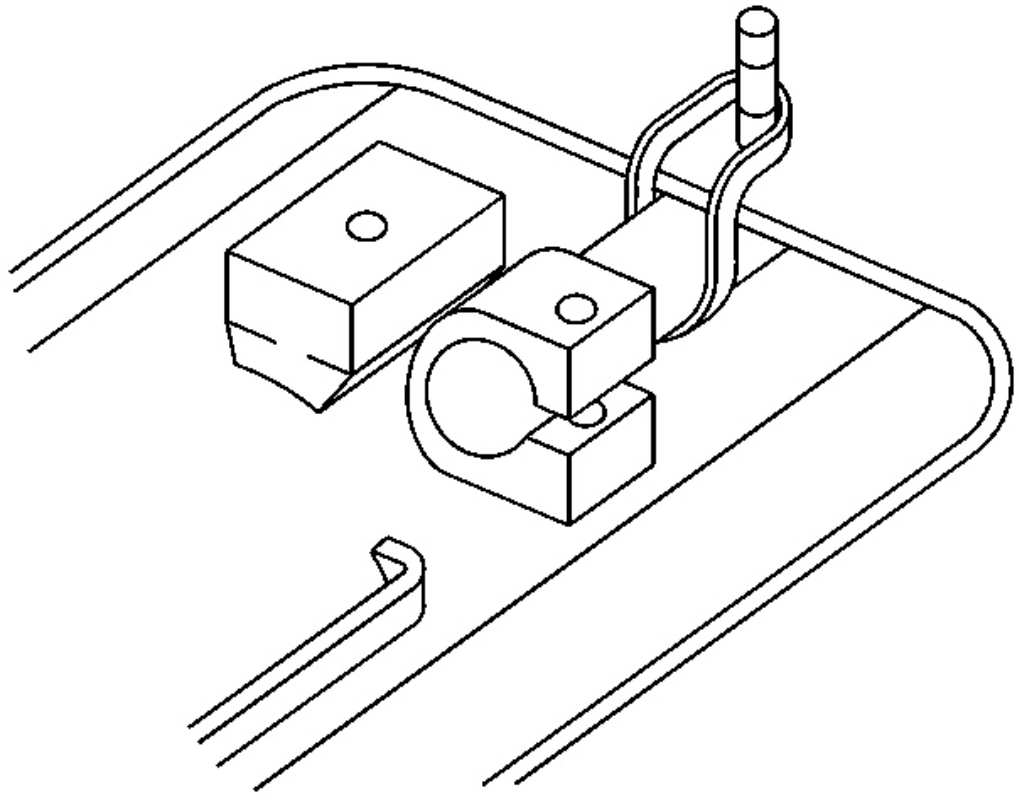


Fig. 180: Transmission Shift Rod At Rear Stud On Top Of Driveline Tunnel To Shift Control
Courtesy of GENERAL MOTORS CORP.

67. Grasp the transmission shift rod and pull up to break the masking tape installed earlier to maintain position during installation.
68. Stretch the rubber band, while still installed onto the transmission shift rod, over the rear stud on top of the driveline tunnel to aid in shift control installation.
69. Install the shift control assembly. Refer to **Shift Control Assembly Replacement**.
70. Break and remove the rubber band.

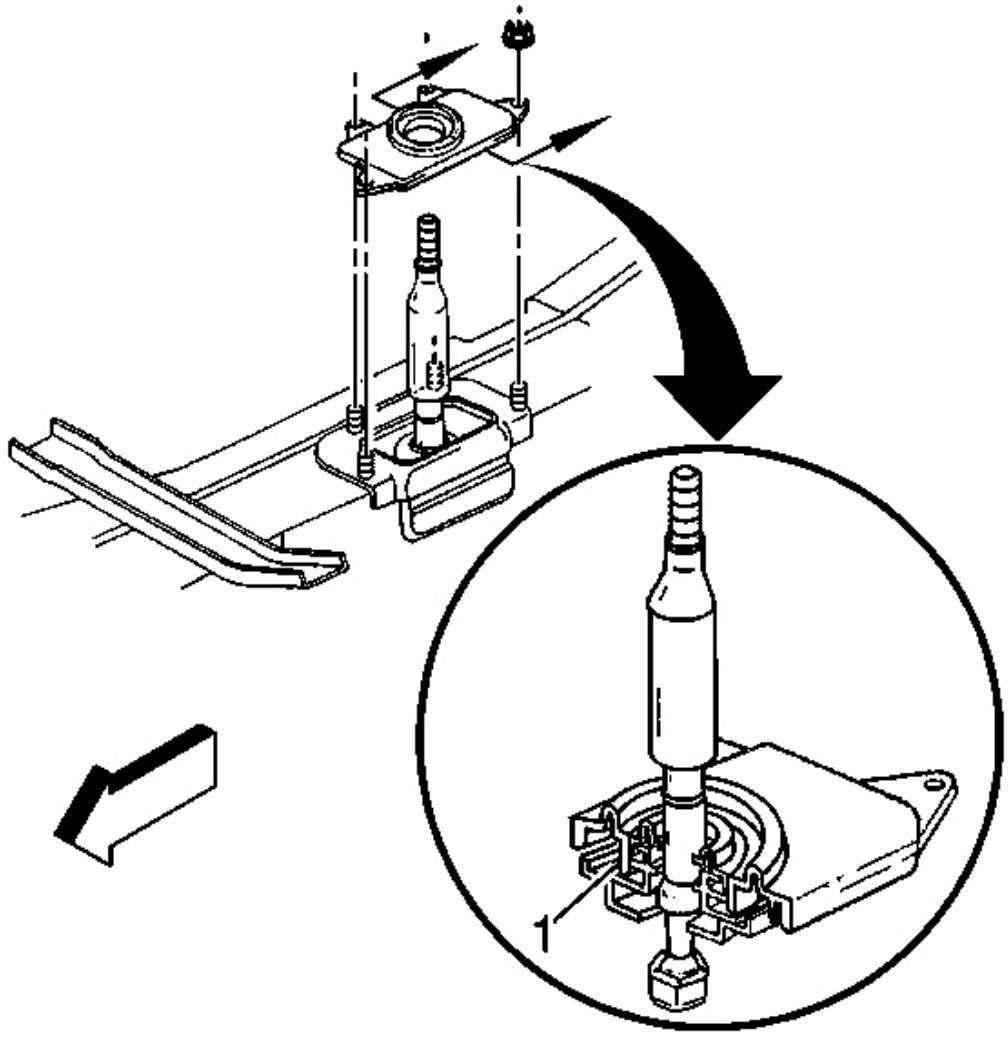


Fig. 181: Shift Control Closeout Boot & Nuts
Courtesy of GENERAL MOTORS CORP.

71. Install the shift control closeout boot.

    Check that the closeout boot fully seats to the shift control lever seal and the base of the shift control assembly (1).

72. Install the shift control closeout boot retaining nuts.

Tighten: Tighten the shift control closeout boot retaining nuts to 12 N.m (106 lb in).

73. Install the I/P accessory trim plate. Refer to **Instrument Panel Accessory Trim Plate Replacement** .
74. Install the shift control boot and knob. Refer to **Transmission Control Boot Replacement**.
75. Install the console. Refer to **Console Replacement** .
76. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection (6.0L)** or **Battery Negative Cable Disconnection and Connection (7.0L)** .

    Tighten: Tighten the negative battery cable bolt to 15 N.m (11 lb ft).

77. Program the transmitters. Refer to **Transmitter Programming (Domestic and Japan)** or **Transmitter Programming (Export - Including Canada)** .
78. Bleed the clutch hydraulic system. Refer to **Hydraulic Clutch Bleeding** .

TRANSMISSION DISASSEMBLE (CORVETTE Z06)

Extension Housing Removal

Tools Required

- **J 3289-20** Holding Fixture. See **Special Tools**.
- **J 44395** Transmission Holding Fixture. See **Special Tools**.

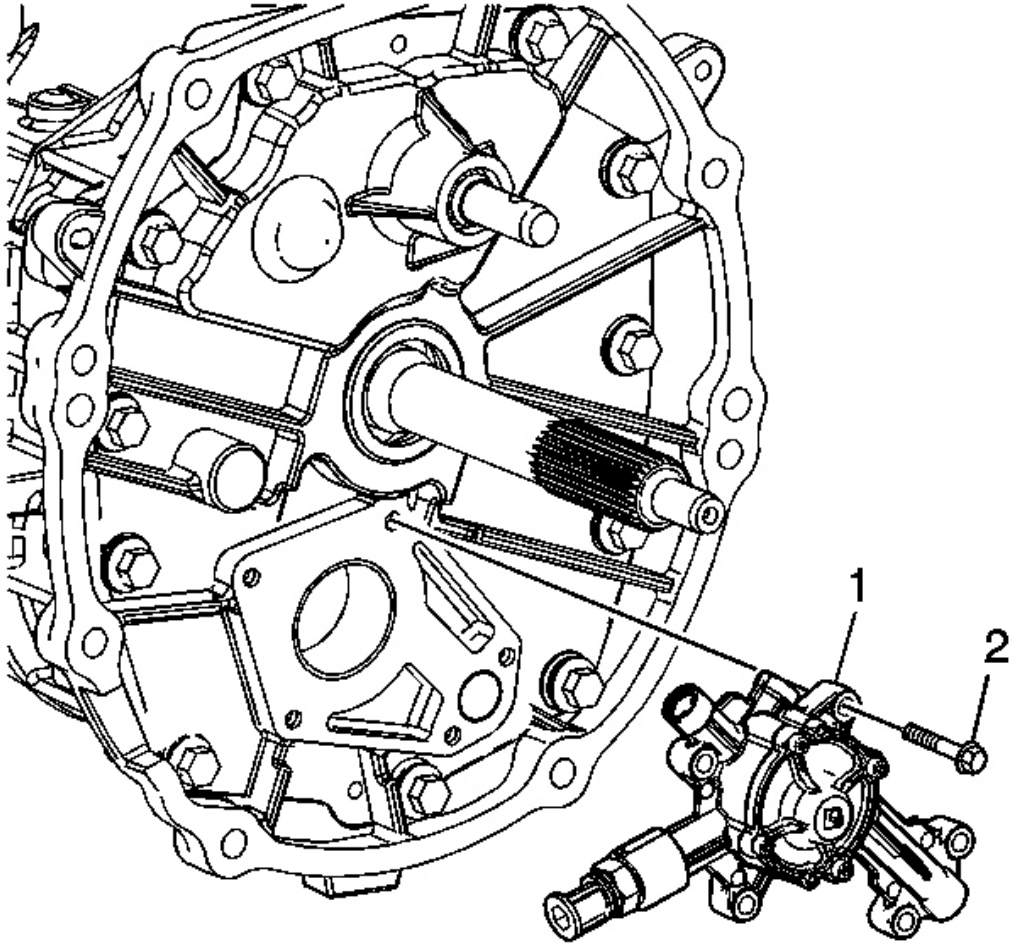


Fig. 182: View Of Auxiliary Coolant Pump & Bolt
Courtesy of GENERAL MOTORS CORP.

1. Remove the auxiliary coolant pump bolt (2) (MY6 only).
2. Remove the auxiliary coolant pump (1) (MY6 only).

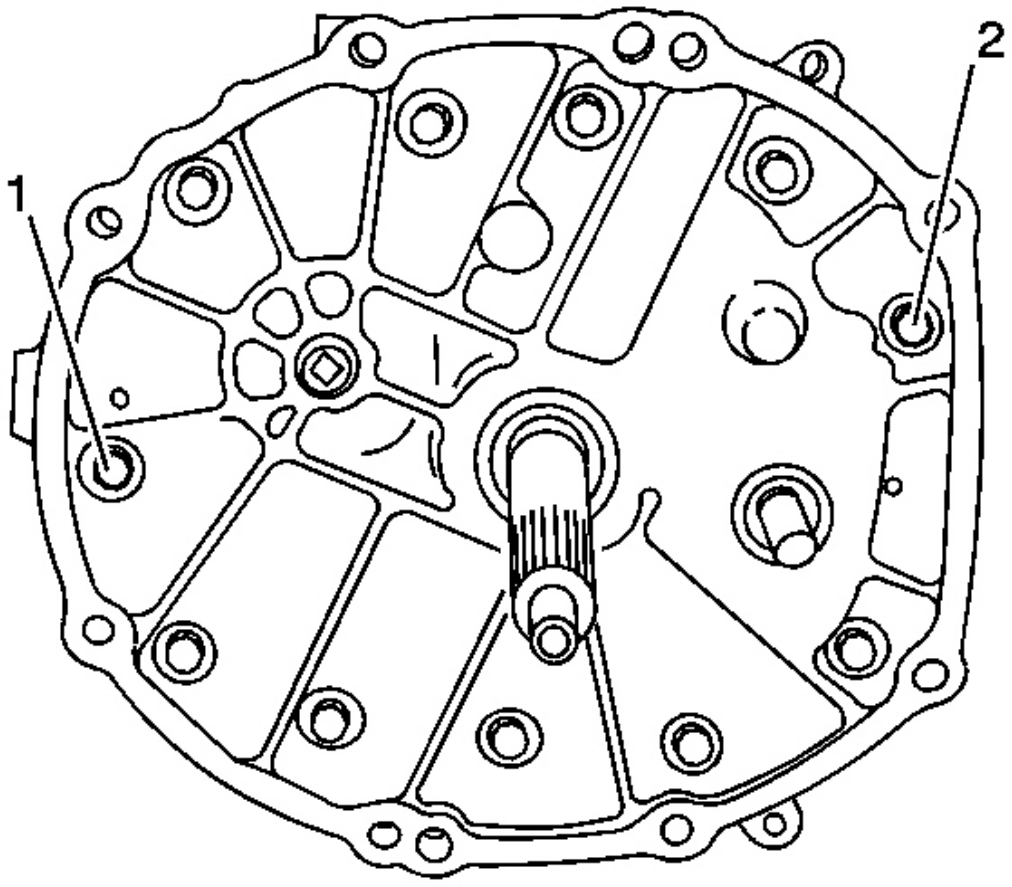


Fig. 183: View Of Adapter Plate Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the adapter plate bolts (1) and (2).

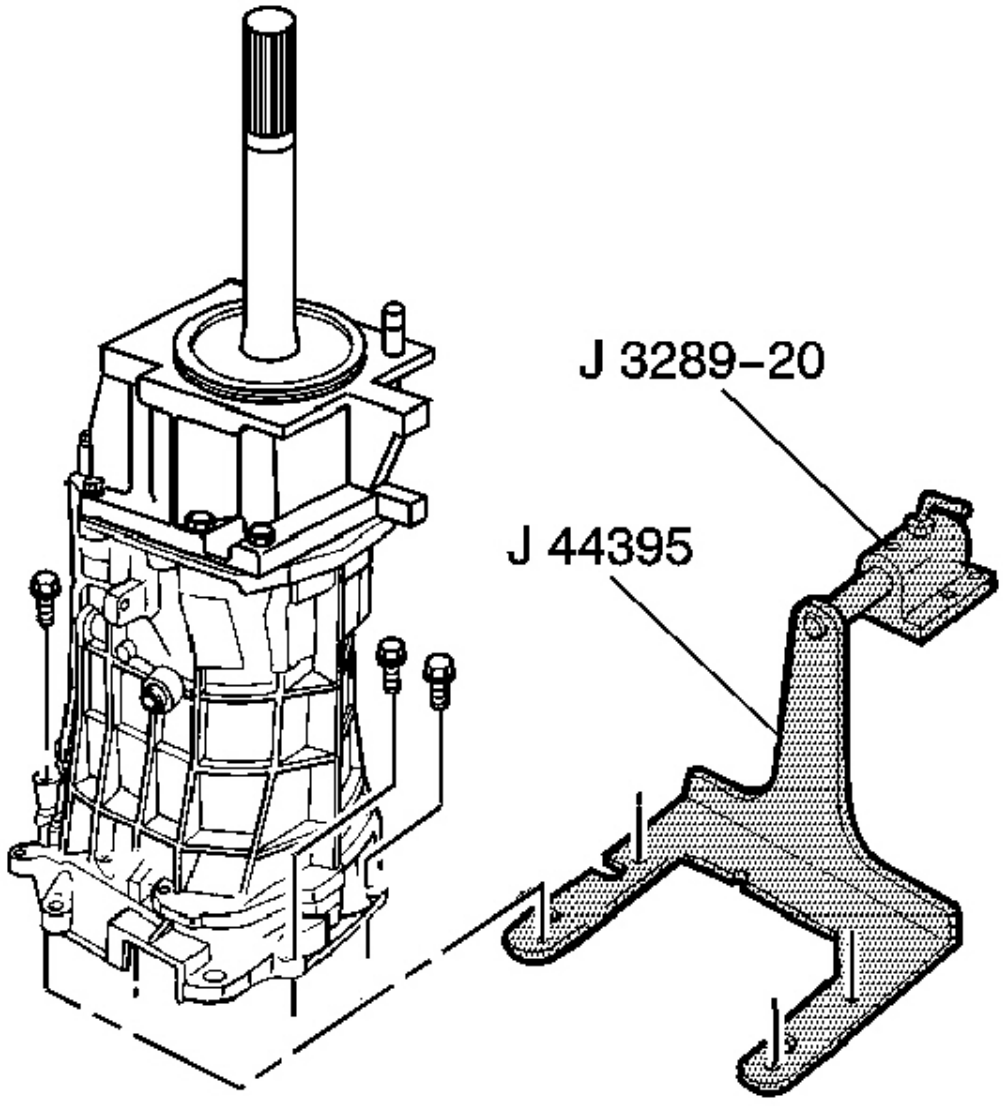


Fig. 184: View Of J 44395 & J 3289-20 With Transmission Case
Courtesy of GENERAL MOTORS CORP.

4. Install the **J 44395** . See **Special Tools**.
5. Mount the transmission on a workbench using the **J 3289-20** . See **Special Tools**.
6. Rotate the transmission into a horizontal position.
7. Remove the transmission drain plug and drain the transmission fluid.

8. Shift the transmission into neutral (N).

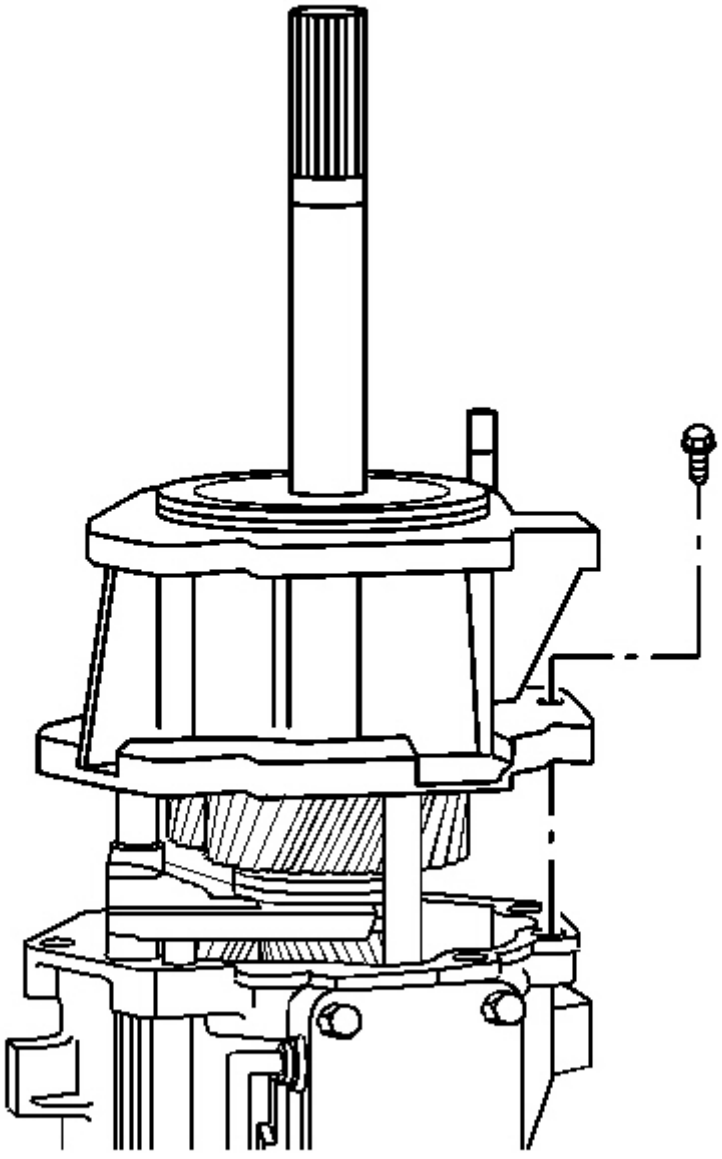


Fig. 185: View Of Extension Housing Bolts & Extension Housing
Courtesy of GENERAL MOTORS CORP.

9. Remove the rear extension housing bolts and the rear extension housing.

Reverse Speed Gear Removal

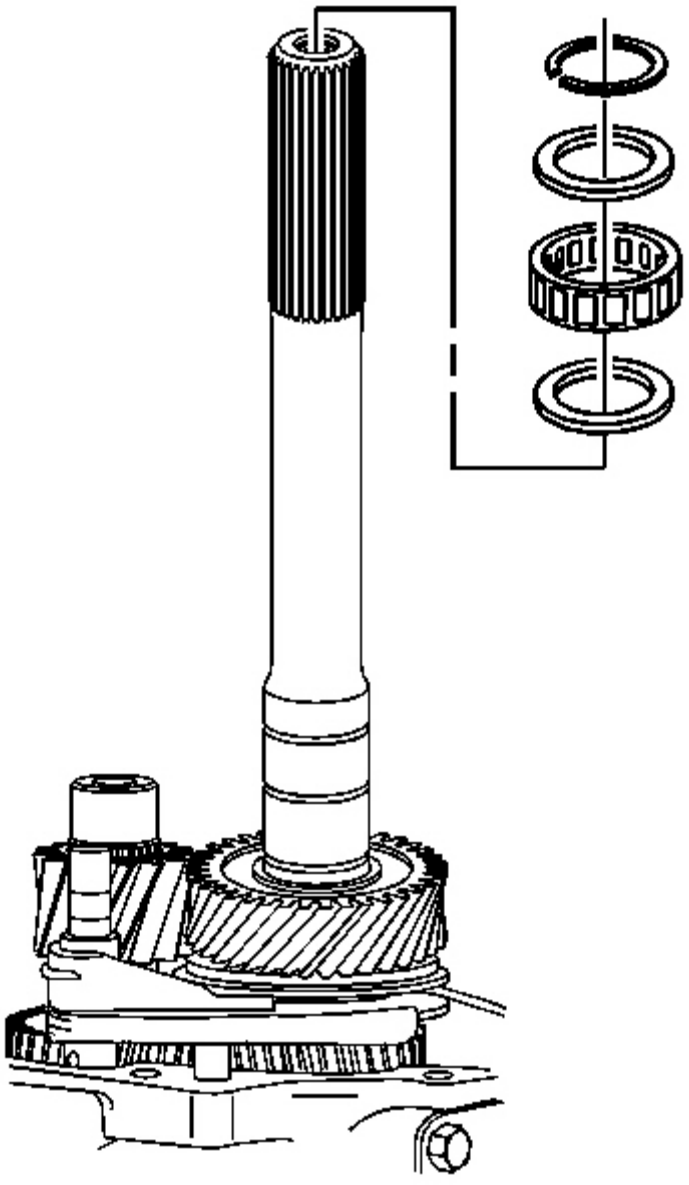


Fig. 186: View Of Rear Bearing Retainer Ring Components
Courtesy of GENERAL MOTORS CORP.

1. Remove the rear bearing retainer ring.
2. Remove the spacer.
3. Remove the mainshaft rear roller bearing.
4. Remove the spacer.

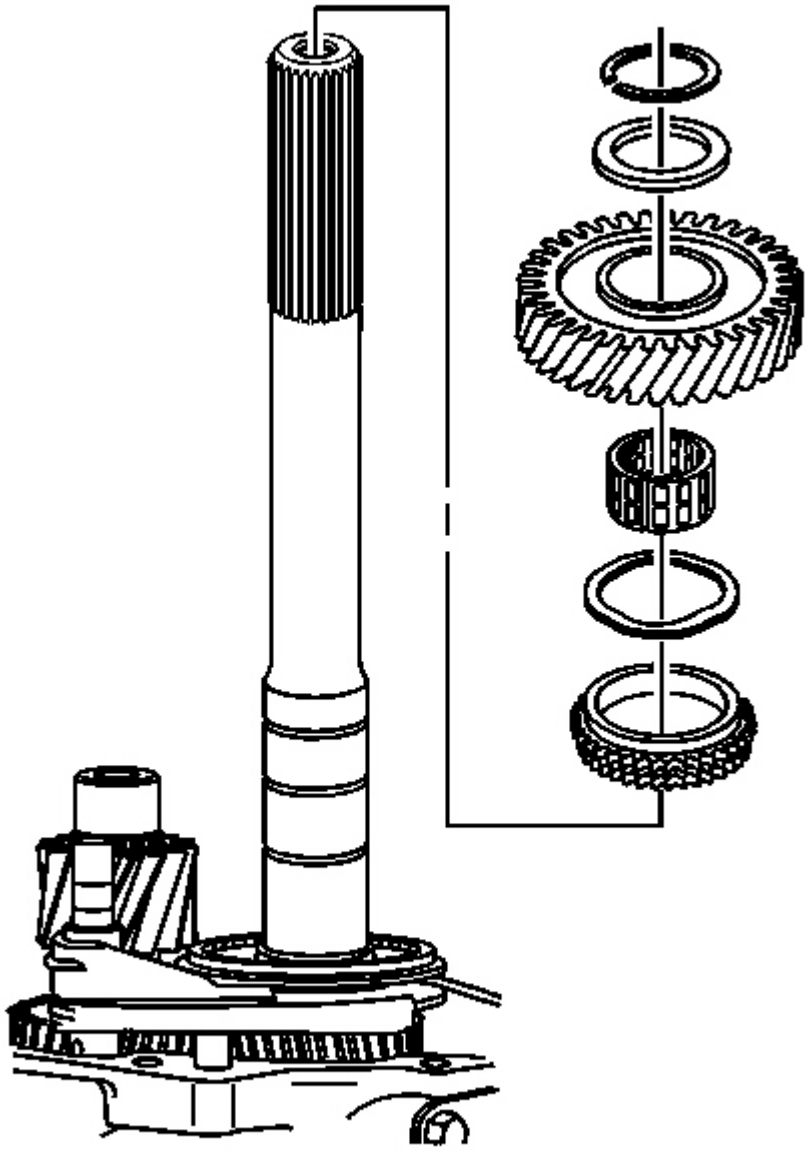


Fig. 187: View Of Reverse Gear Components
Courtesy of GENERAL MOTORS CORP.

5. Remove the retainer ring.
6. Remove the reverse gear thrust washer.
7. Remove the reverse gear.
8. Remove the reverse gear caged needle bearing.
9. Remove the wave washer.
10. Remove the reverse gear synchronizer blocking ring.

Reverse Shift Fork Removal

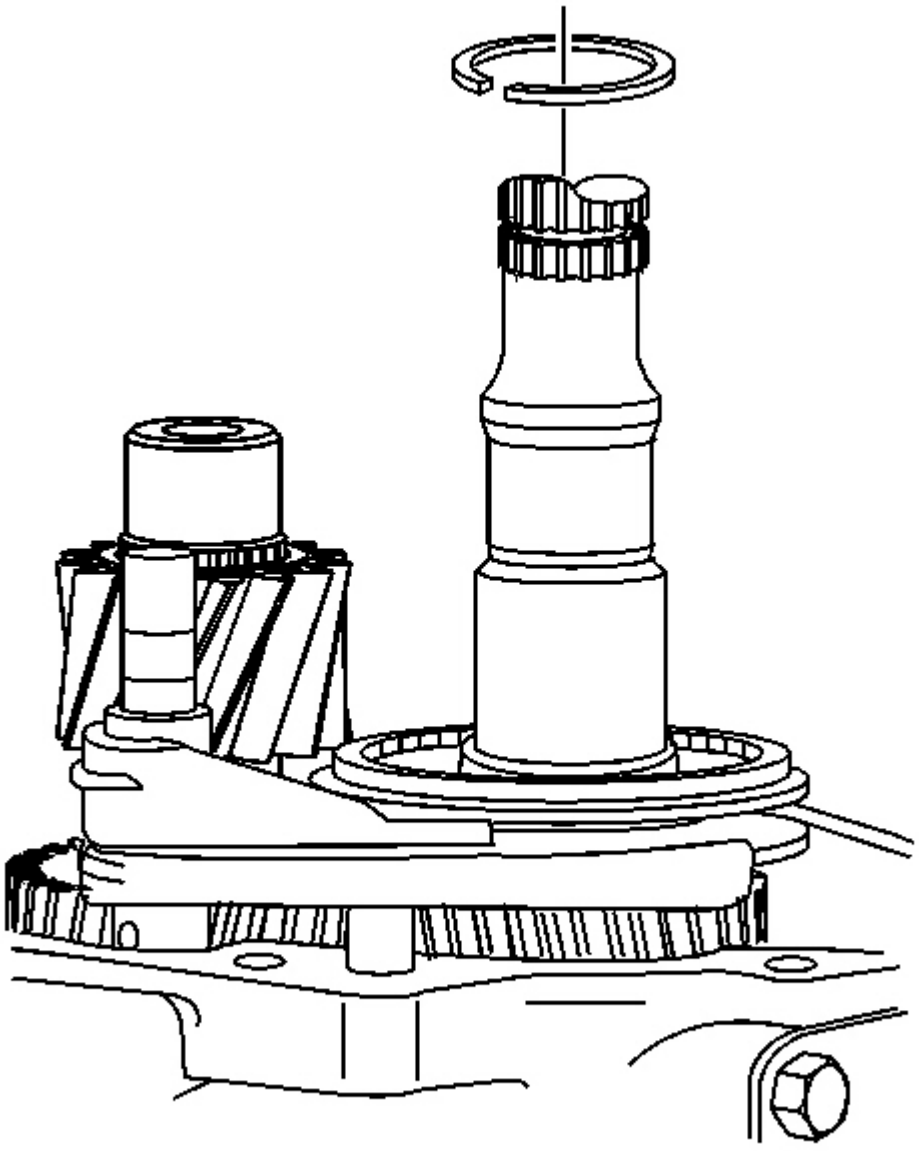


Fig. 188: View Of Reverse Synchronizer Retainer Ring
Courtesy of GENERAL MOTORS CORP.

1. Remove the reverse synchronizer retainer ring.

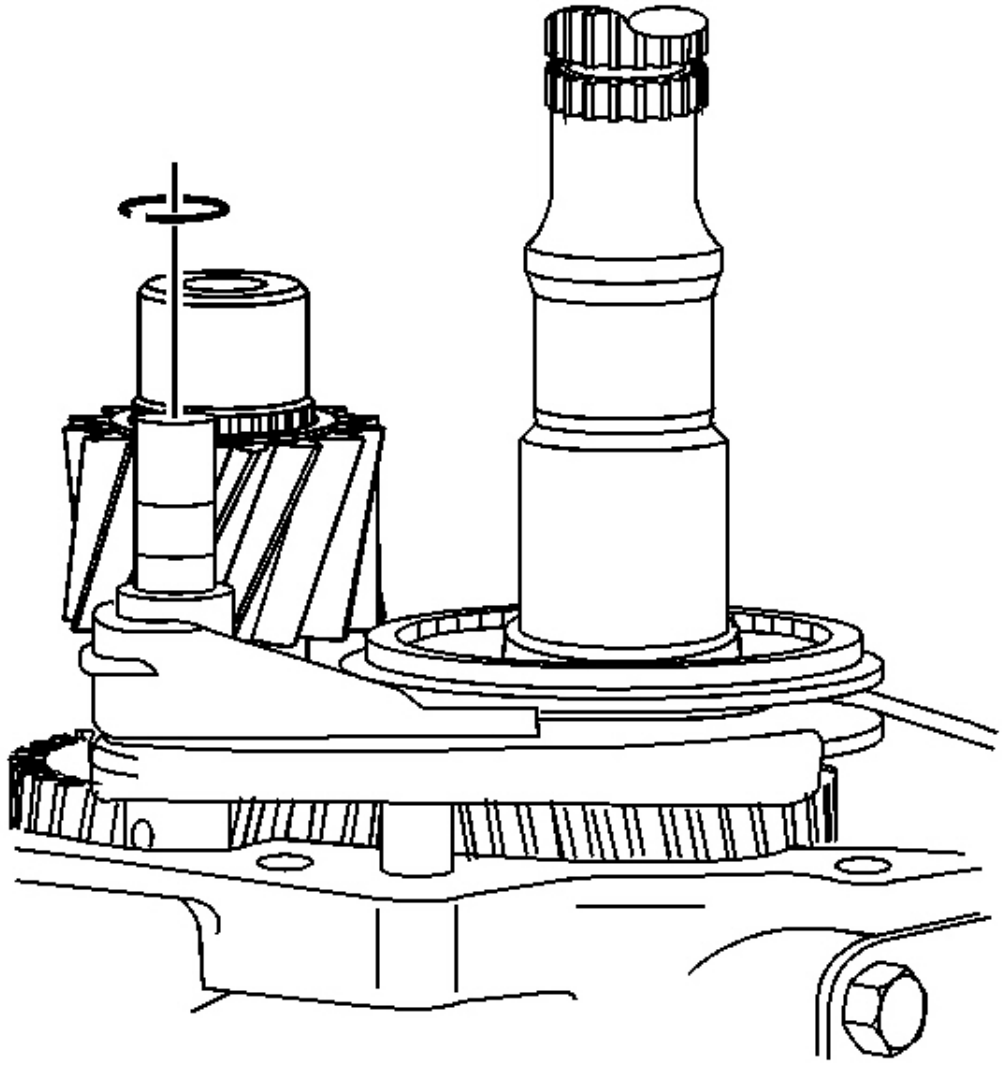


Fig. 189: View Of Reverse Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

2. Remove and discard the reverse shift fork retainer ring.

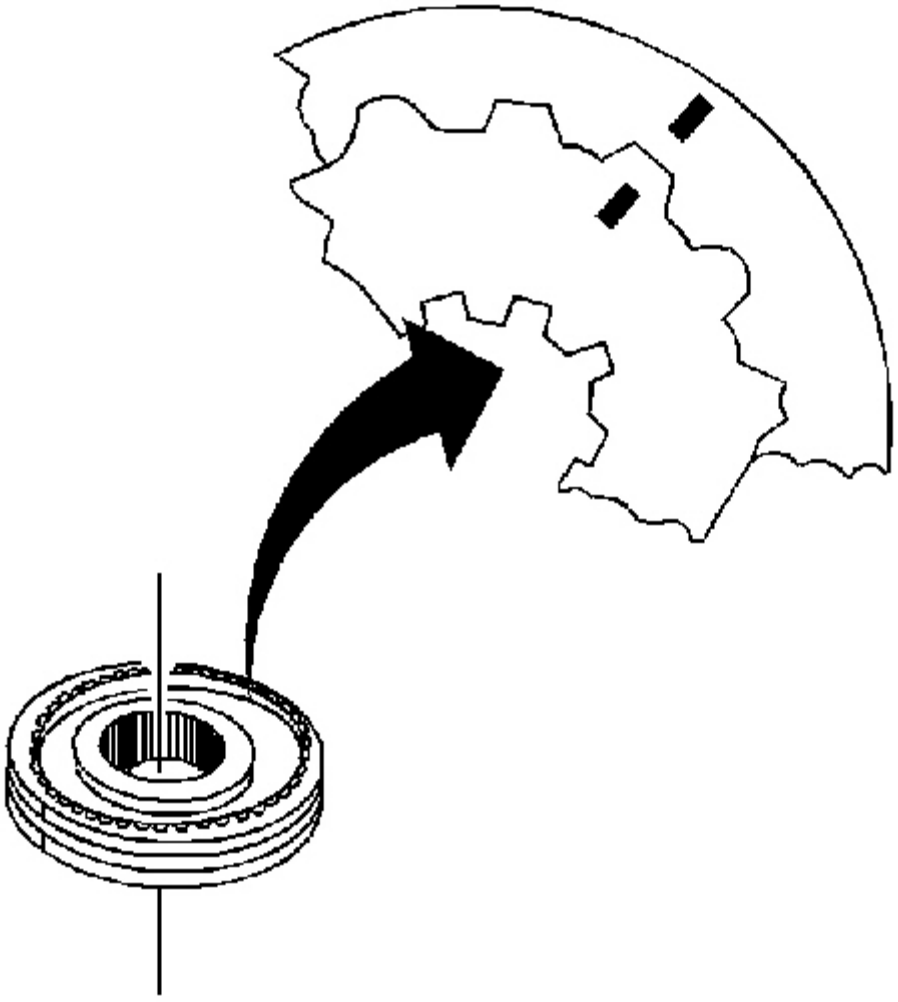


Fig. 190: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

3. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.

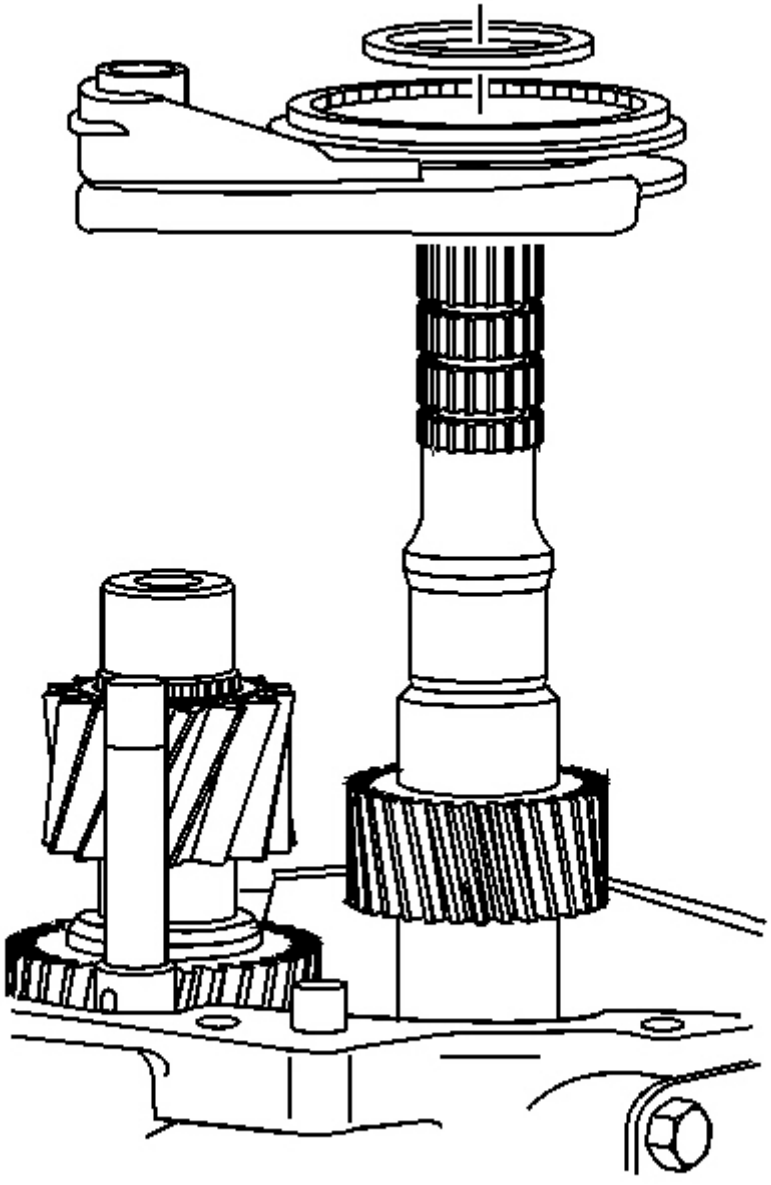


Fig. 191: View Of Thrust Washer, Reverse Synchronizer Assembly, Shift Fork & Retainer Ring
Courtesy of GENERAL MOTORS CORP.

4. Remove the following parts in order:

1. The thrust washer
2. The reverse synchronizer assembly and the shift fork
3. The retainer ring

5th/6th Speed Driven Gear Removal

Tools Required

- **J 8433** Universal Bridge Puller. See **Special Tools**.
- **J 39431-1** Gear Remover and Bolts. See **Special Tools**.

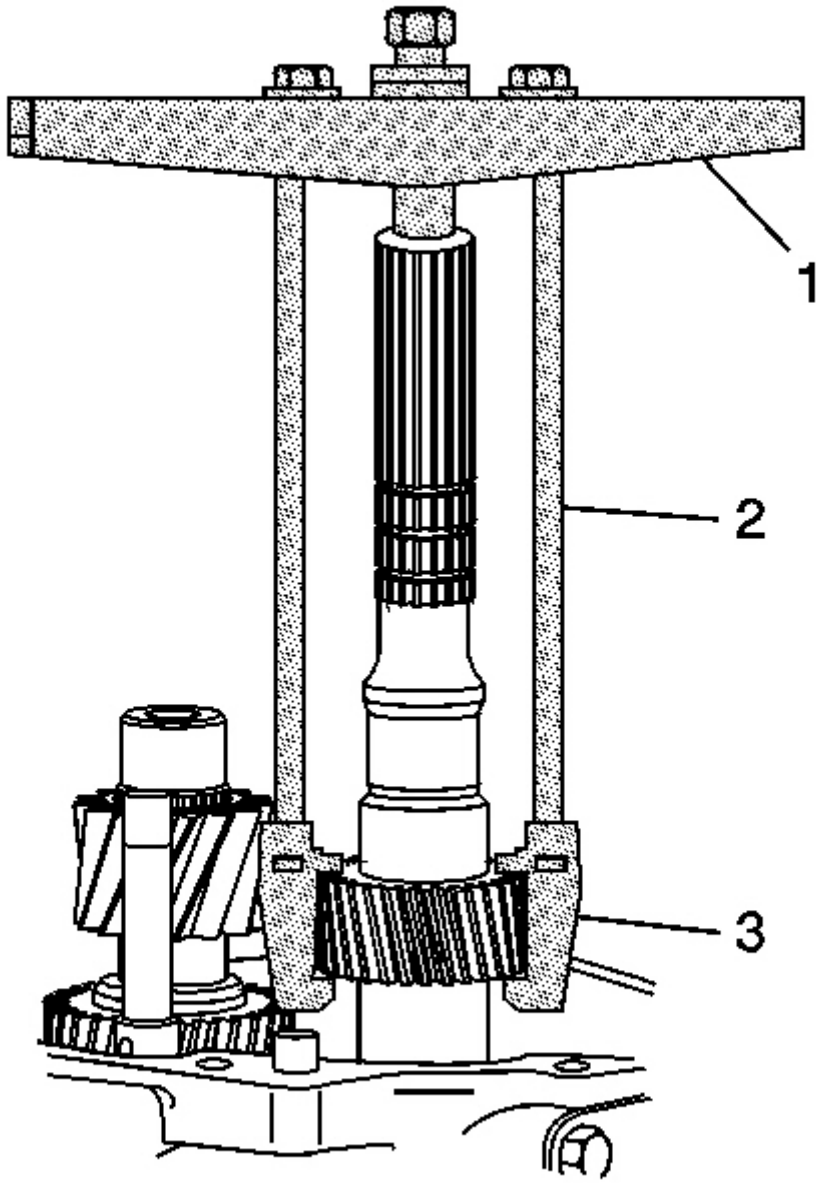


Fig. 192: View Of Special Tools J 8433 & J 39431-1
Courtesy of GENERAL MOTORS CORP.

Remove the 5th/6th speed driven gear. Use the **J 8433** (1), the **J 39431-1** (3) and the J 39431-4 (2). See **Special Tools**.

Countershaft Gear Removal

Tools Required

J 25031-A Three Jaw Puller. See **Special Tools**.

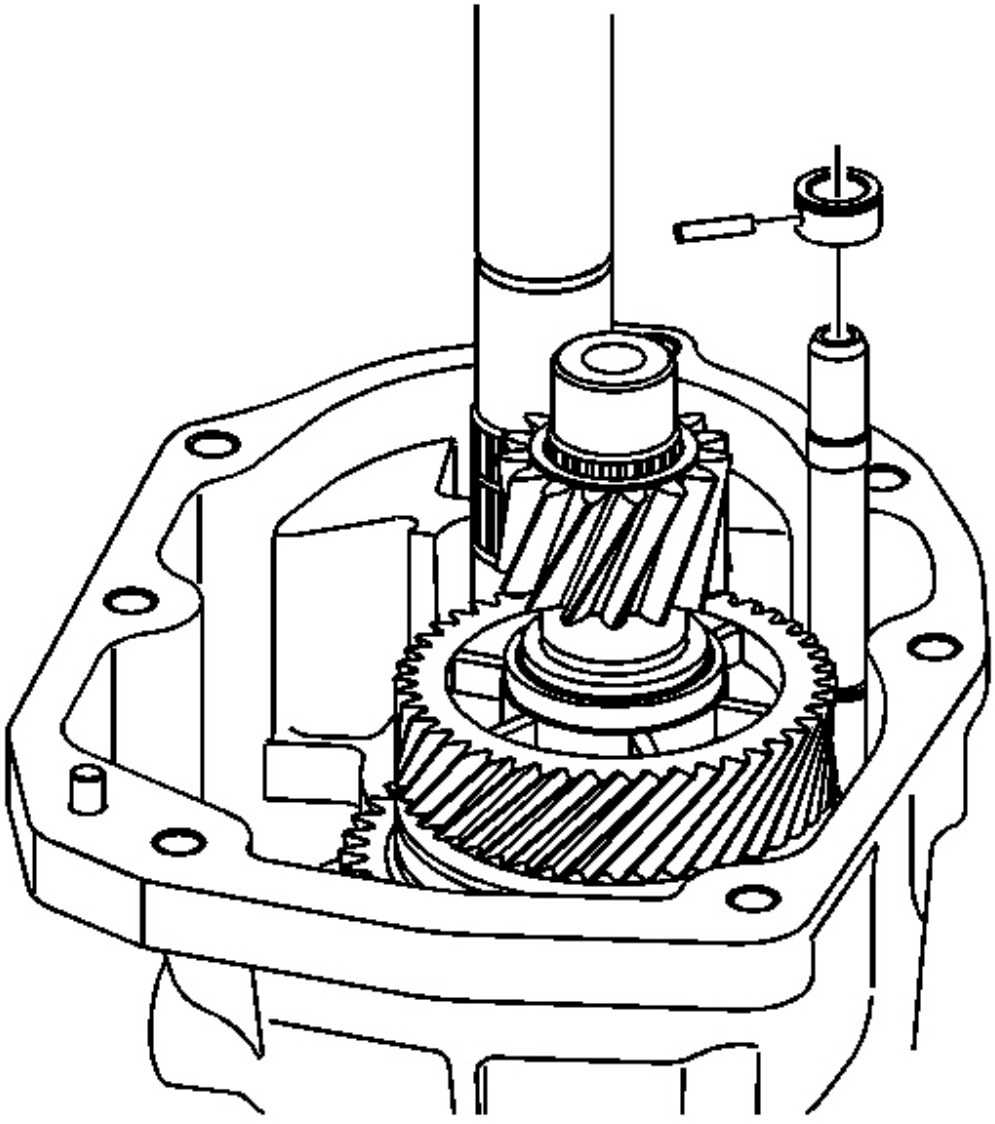


Fig. 193: View Of Reverse Shift Shaft Pin, Collar & Countershaft Retainer Clip

Courtesy of GENERAL MOTORS CORP.

1. Remove the reverse shift shaft pin and collar. Remove the countershaft retainer clip.

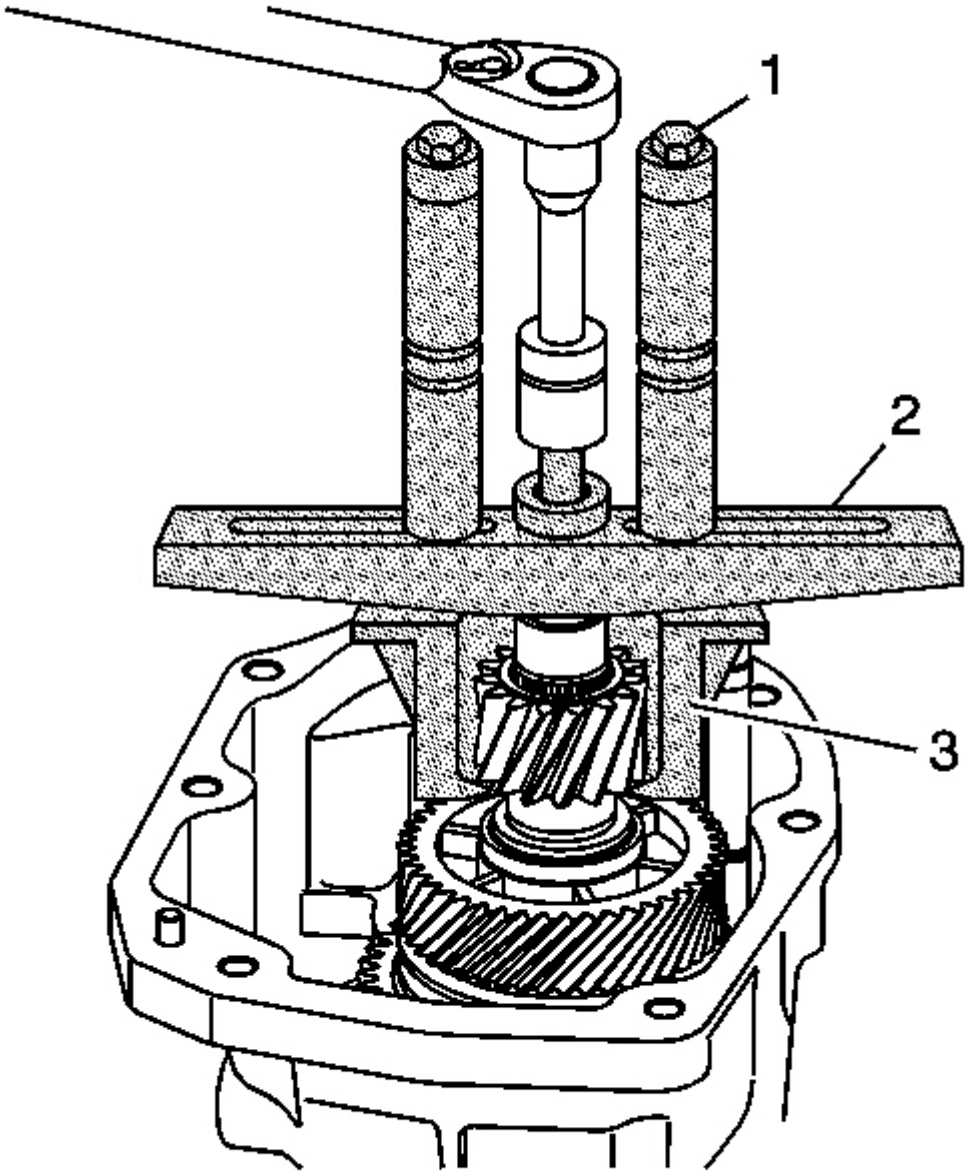


Fig. 194: Special Tools J 8433 & J 39431-1

Courtesy of GENERAL MOTORS CORP.

2. Attach the **J 8433** (2), the **J 39431-1** (3) and the J 39431-4 (1). See **Special Tools**.

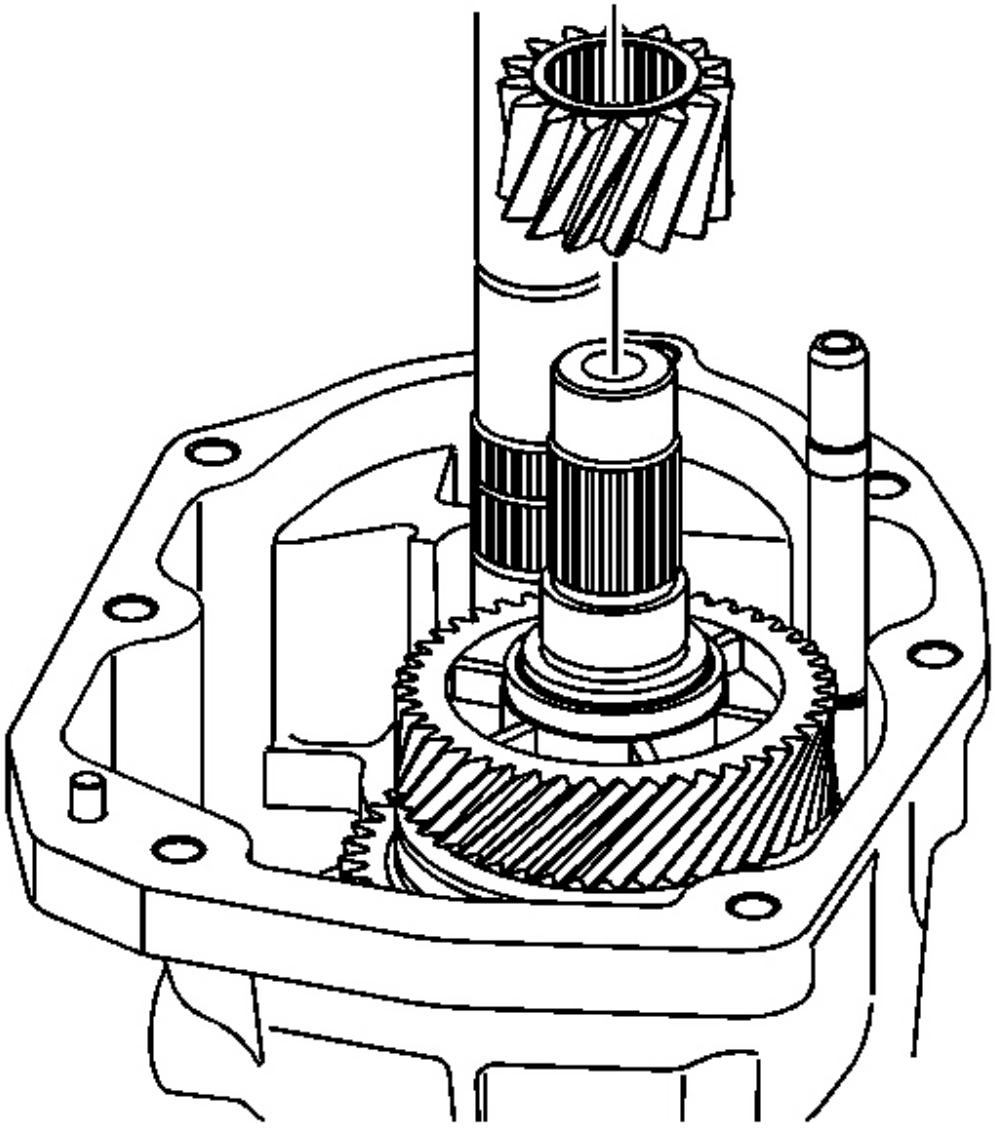


Fig. 195: View Of Countershaft Gear
Courtesy of GENERAL MOTORS CORP.

3. Remove the countershaft gear.

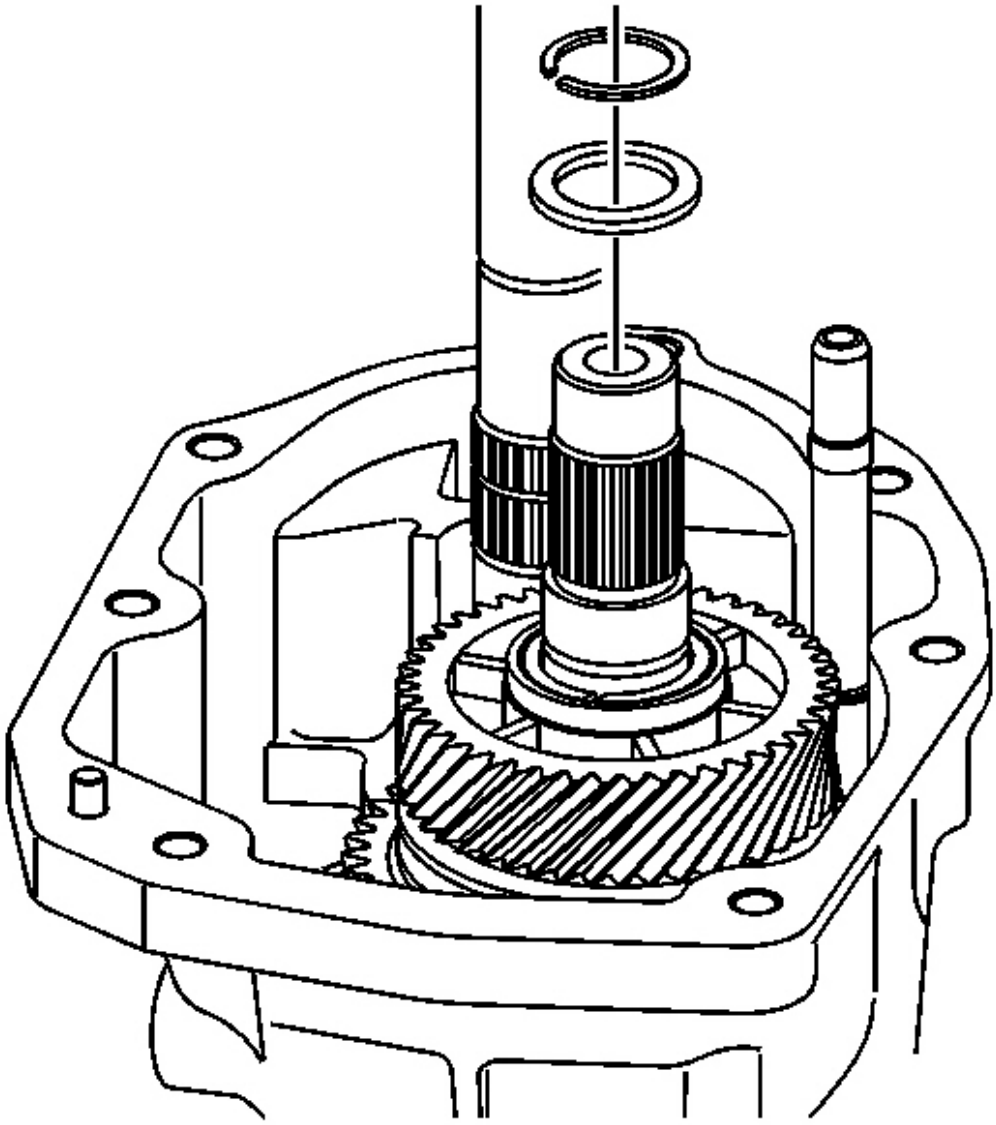


Fig. 196: View Of Countershaft Retainer And Spacer
Courtesy of GENERAL MOTORS CORP.

4. Remove the countershaft retainer and spacer.

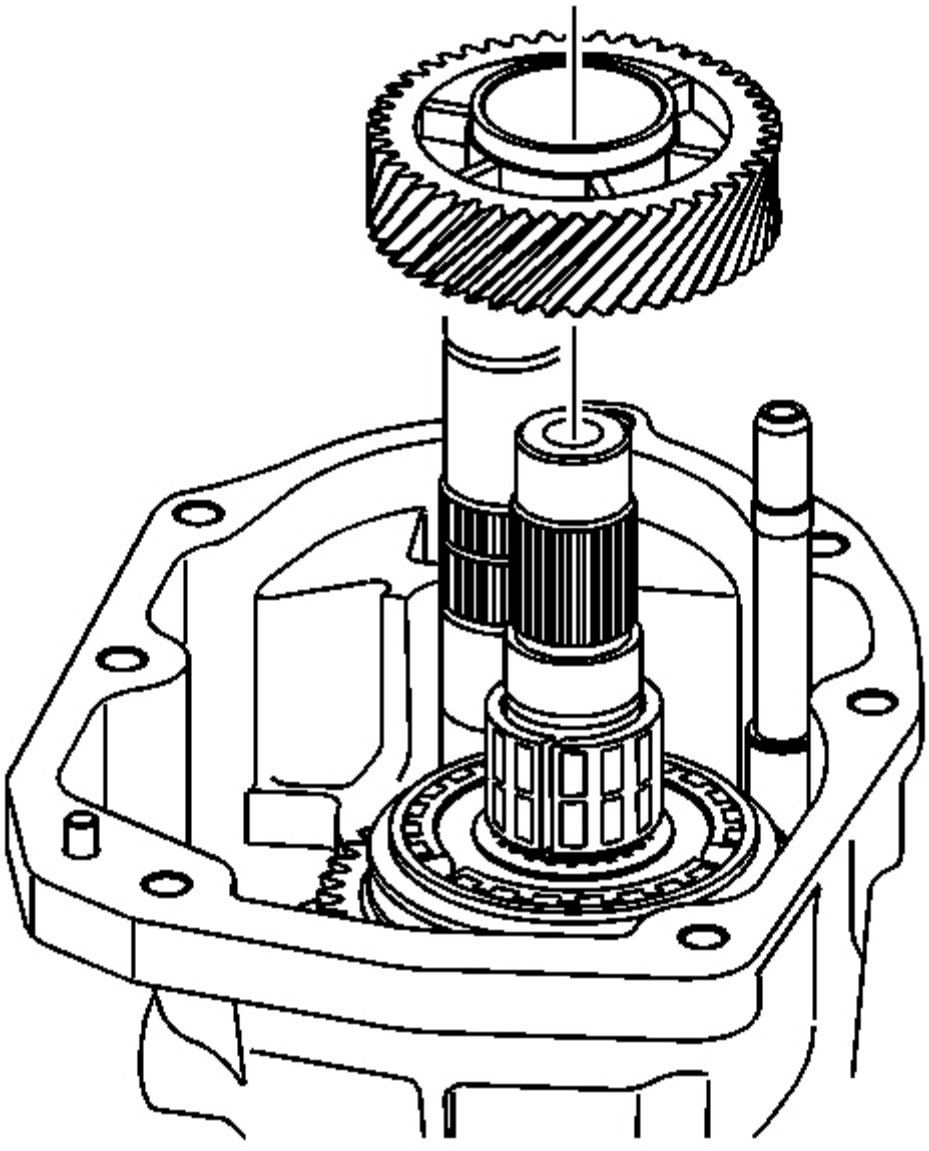


Fig. 197: View Of Countershaft Gear
Courtesy of GENERAL MOTORS CORP.

5. Remove the gear from the countershaft.

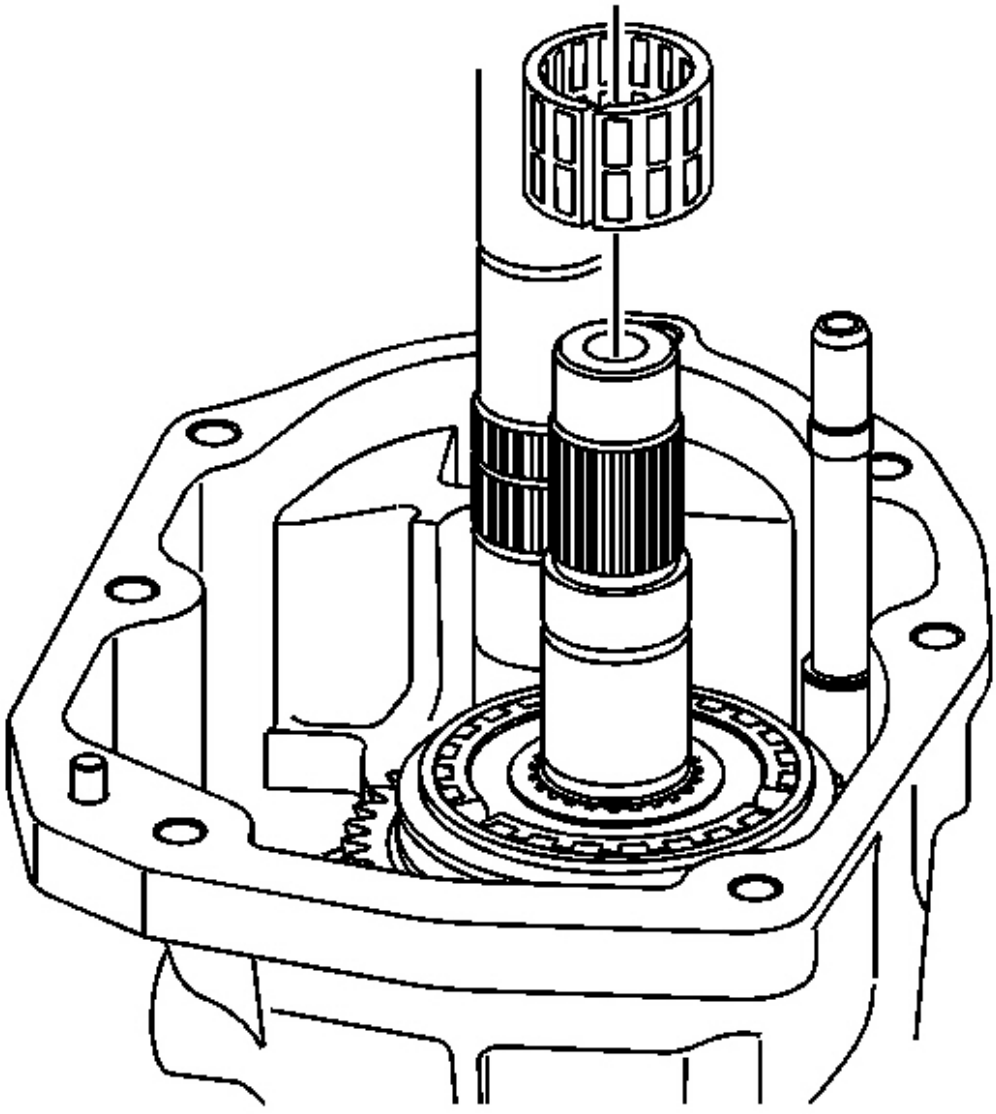


Fig. 198: View Of Needle Bearing
Courtesy of GENERAL MOTORS CORP.

6. Remove the needle bearing from the countershaft.

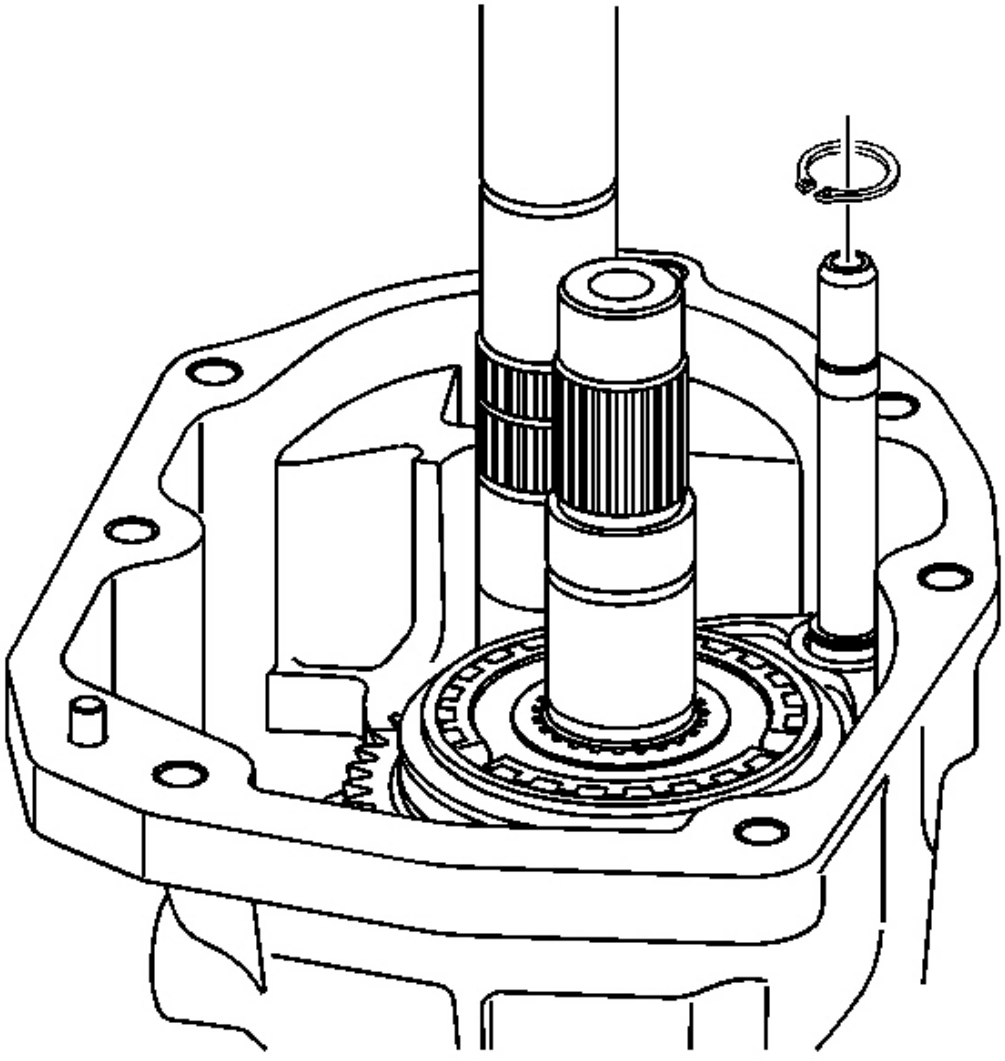


Fig. 199: View Of 5th/6th Speed Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

7. Remove the 5th/6th speed shift fork retainer ring.

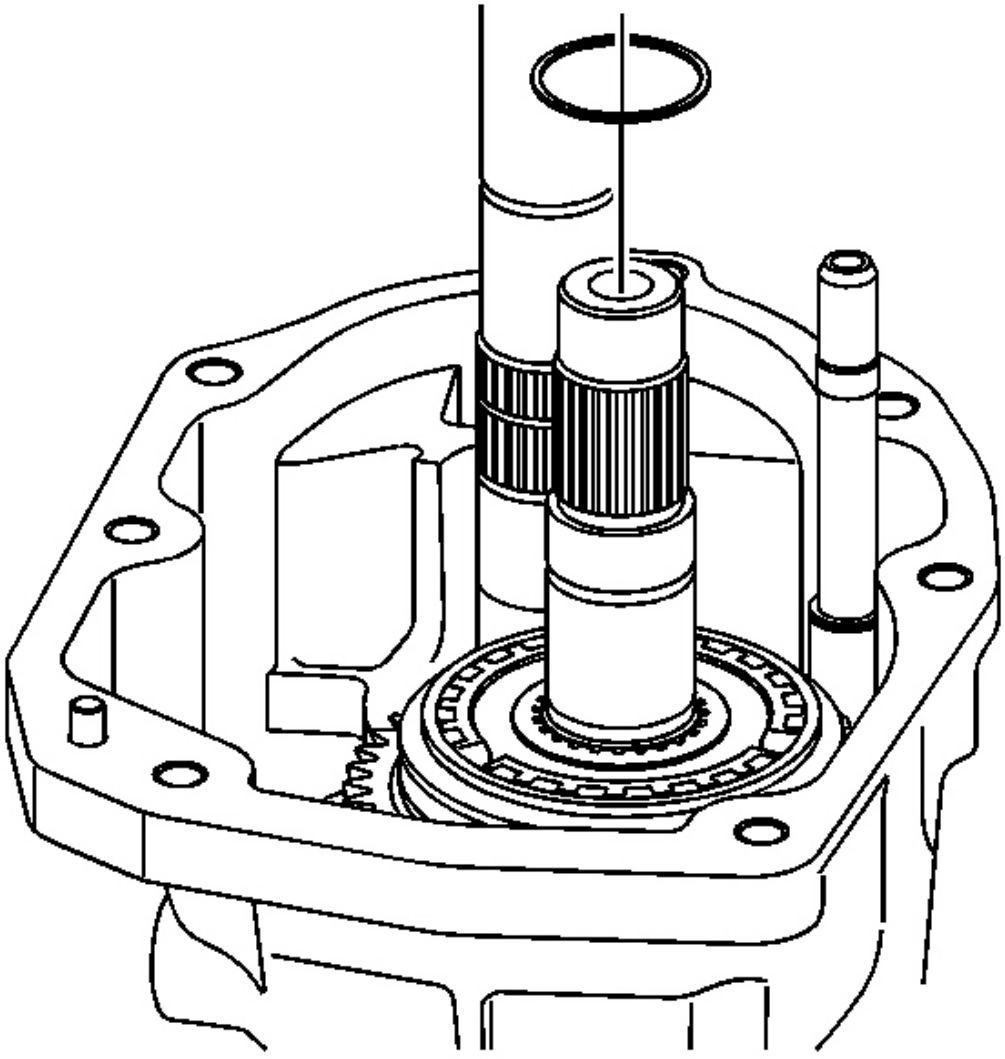


Fig. 200: View Of Countershaft Spacer
Courtesy of GENERAL MOTORS CORP.

8. Remove the spacer from the countershaft.

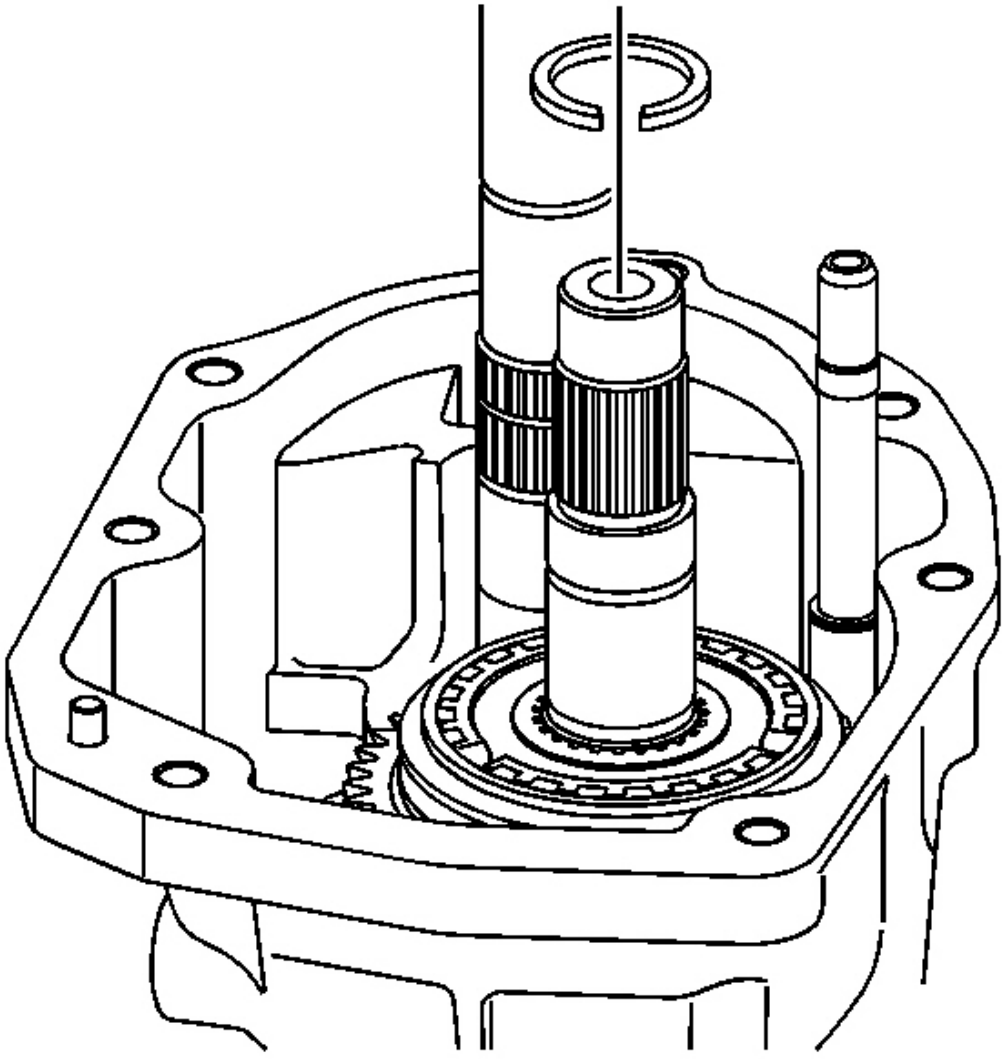


Fig. 201: View Of Retainer Clip
Courtesy of GENERAL MOTORS CORP.

9. Remove the retainer clip from the countershaft.

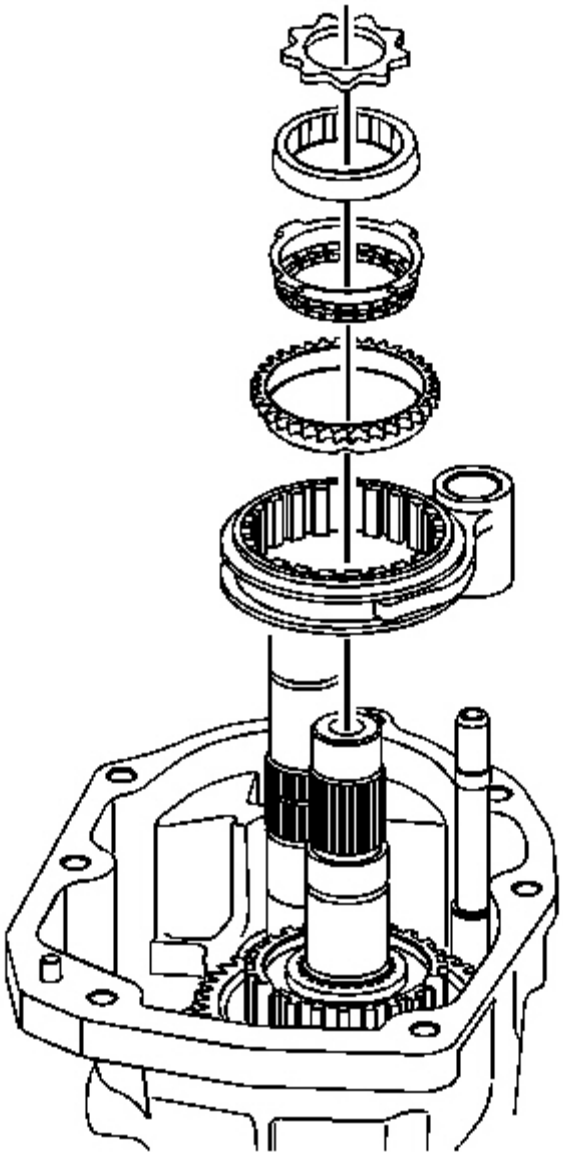


Fig. 202: View Of 5th/6th Shift Fork, Synchronizer Sleeve, Speed Drive Gear Synchronizer Blocking Ring, Friction Cone, Inner Cone & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

10. Remove the 5th/6th shift fork, synchronizer sleeve, speed drive gear synchronizer blocking ring, speed drive gear friction cone, speed drive gear inner cone, speed drive gear thrust

washer.

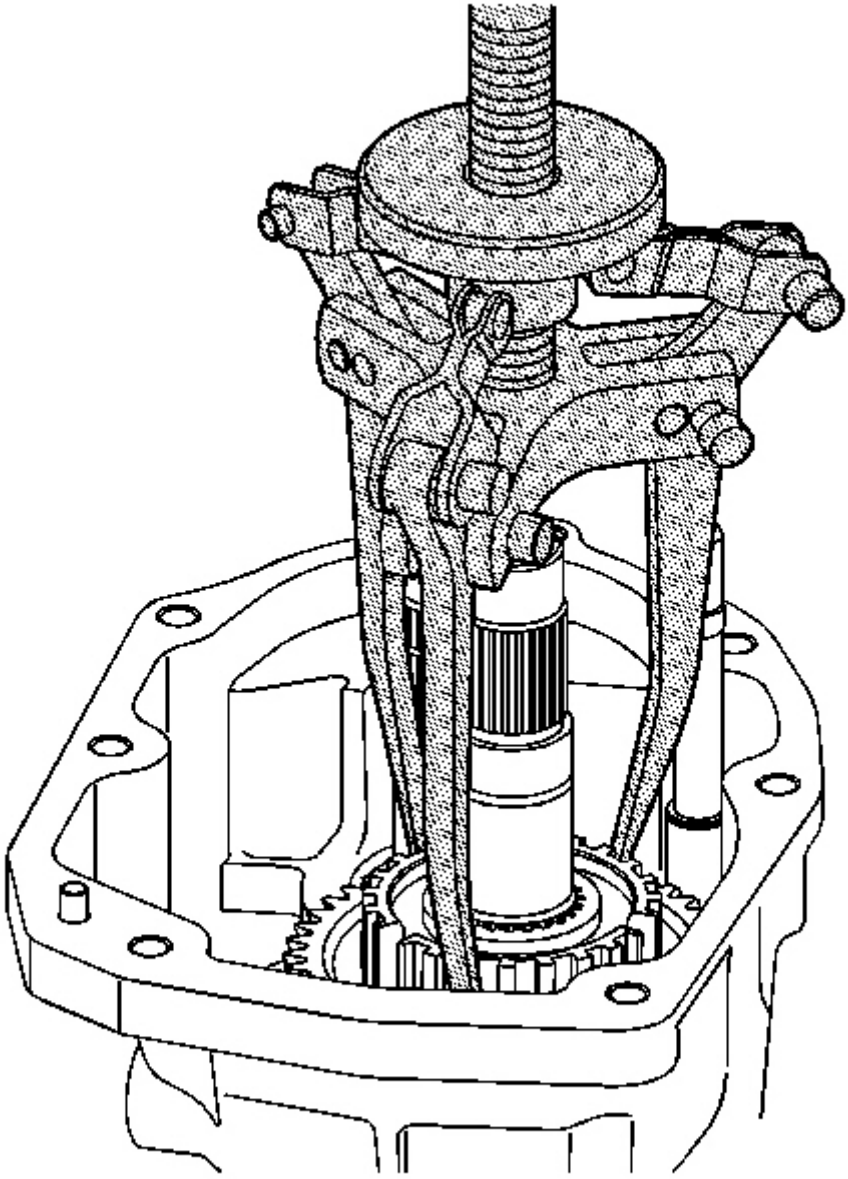


Fig. 203: Special Tool J 25031-A
Courtesy of GENERAL MOTORS CORP.

11. Install the **J 25031-A** to the synchronizer hub assembly. See **Special Tools**.

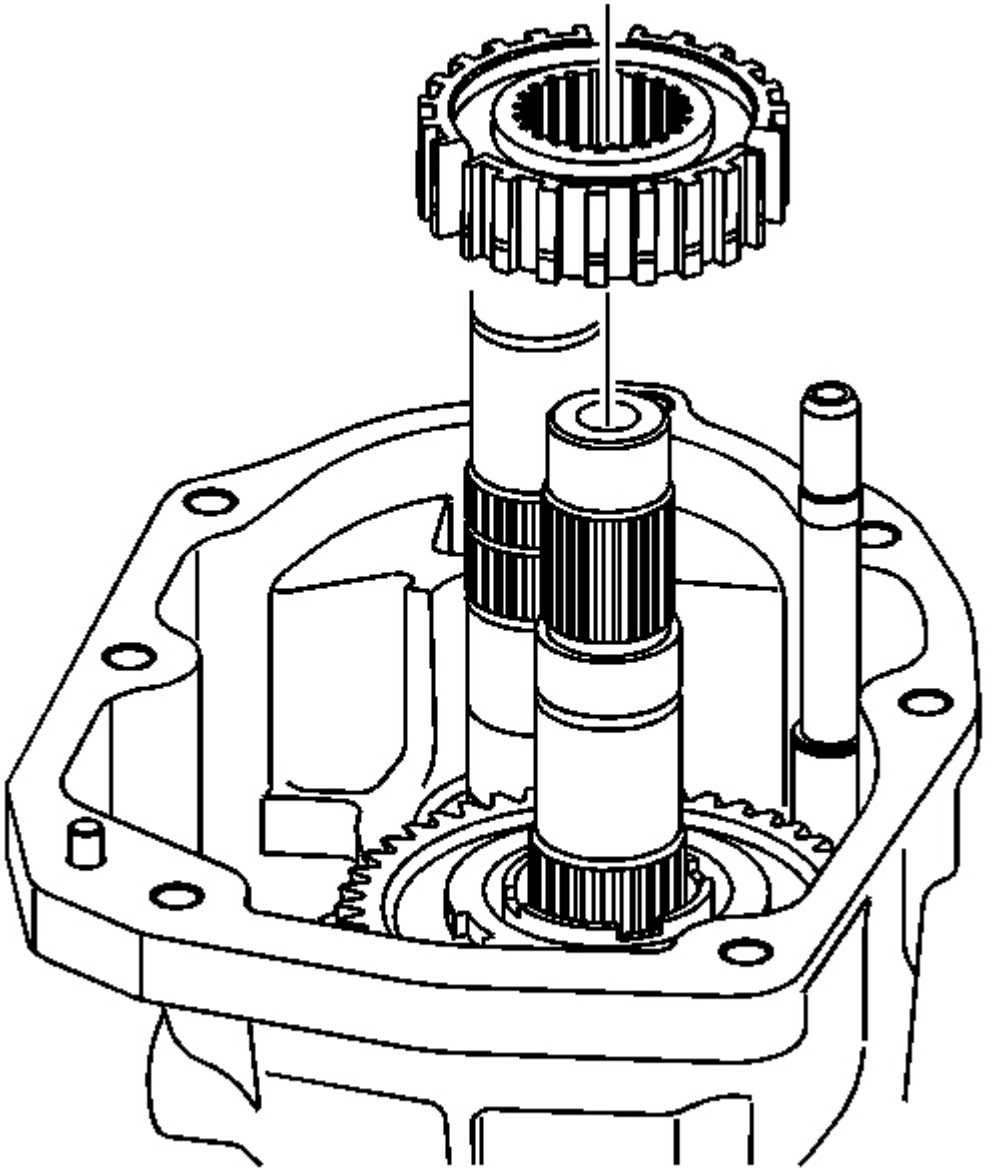


Fig. 204: View Of Synchronizer Hub Assembly
Courtesy of GENERAL MOTORS CORP.

12. Remove the synchronizer hub assembly.

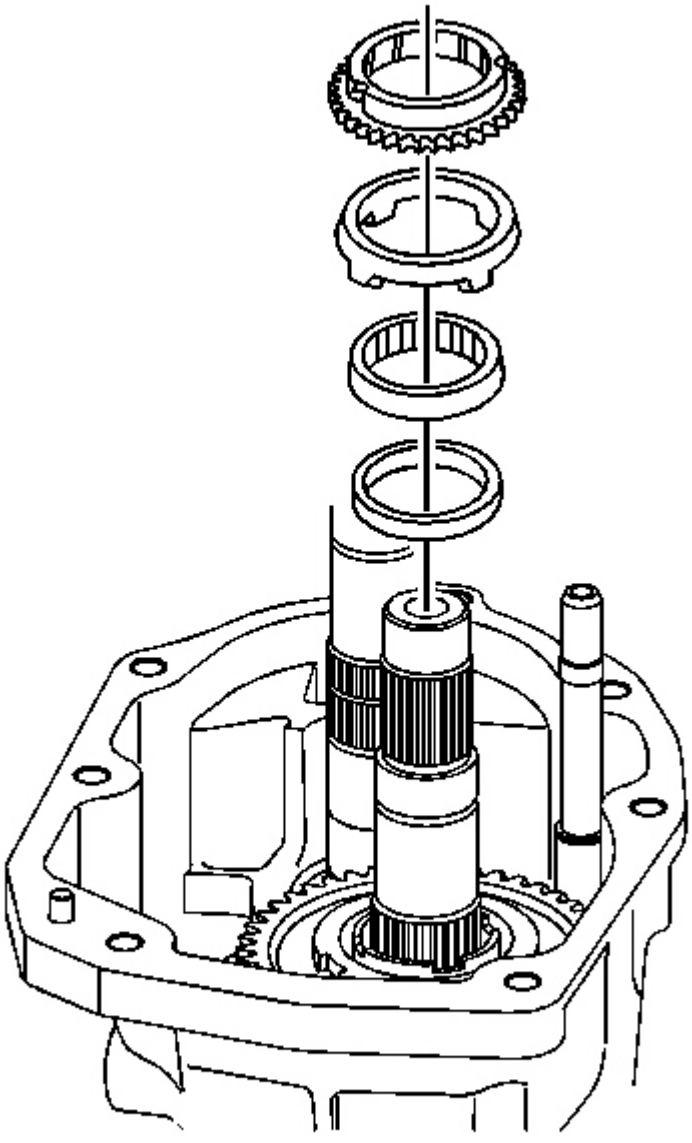


Fig. 205: View Of 5th/6th Shift Fork, Synchronizer Sleeve, Speed Drive Gear Synchronizer Blocking Ring, Friction Cone, Inner Cone & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

13. Remove the 5th/6th shift fork, synchronizer sleeve, speed drive gear synchronizer blocking ring, speed drive gear friction cone, speed drive gear inner cone, speed drive gear thrust washer.

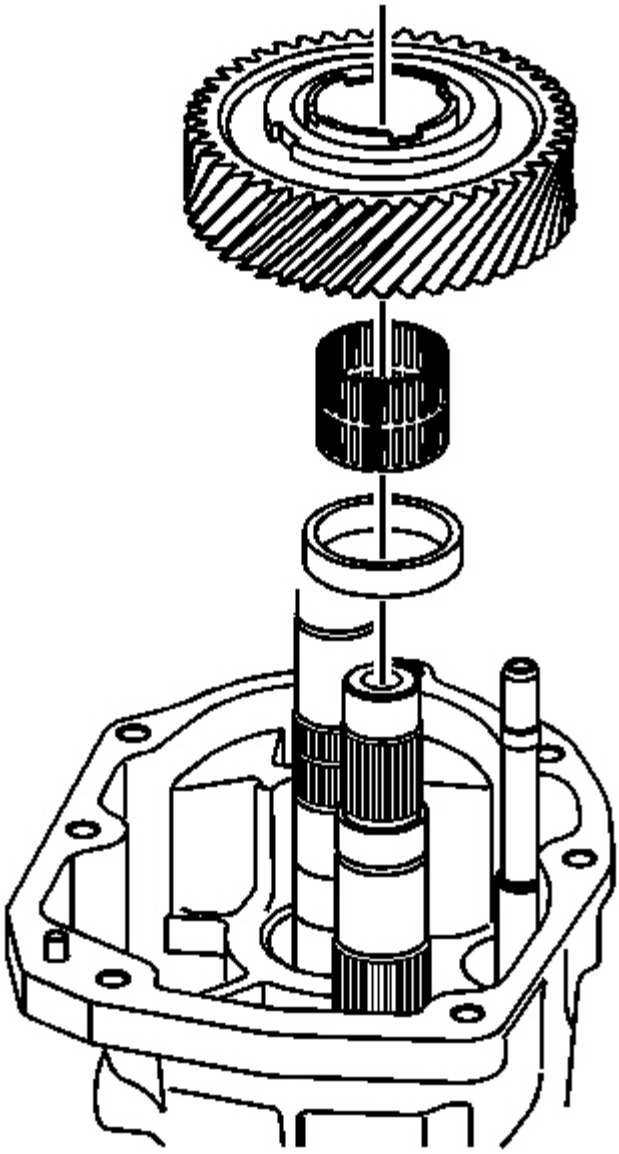


Fig. 206: View Of 6th Driven Gear, Caged Needle Bearing & Spacer

Courtesy of GENERAL MOTORS CORP.

14. Remove the 6th driven gear, caged needle bearing, and spacer.

Transmission Case Removal

Tools Required

J 41099 Skip Shift Sensor Remover/ Installer. See **Special Tools**.

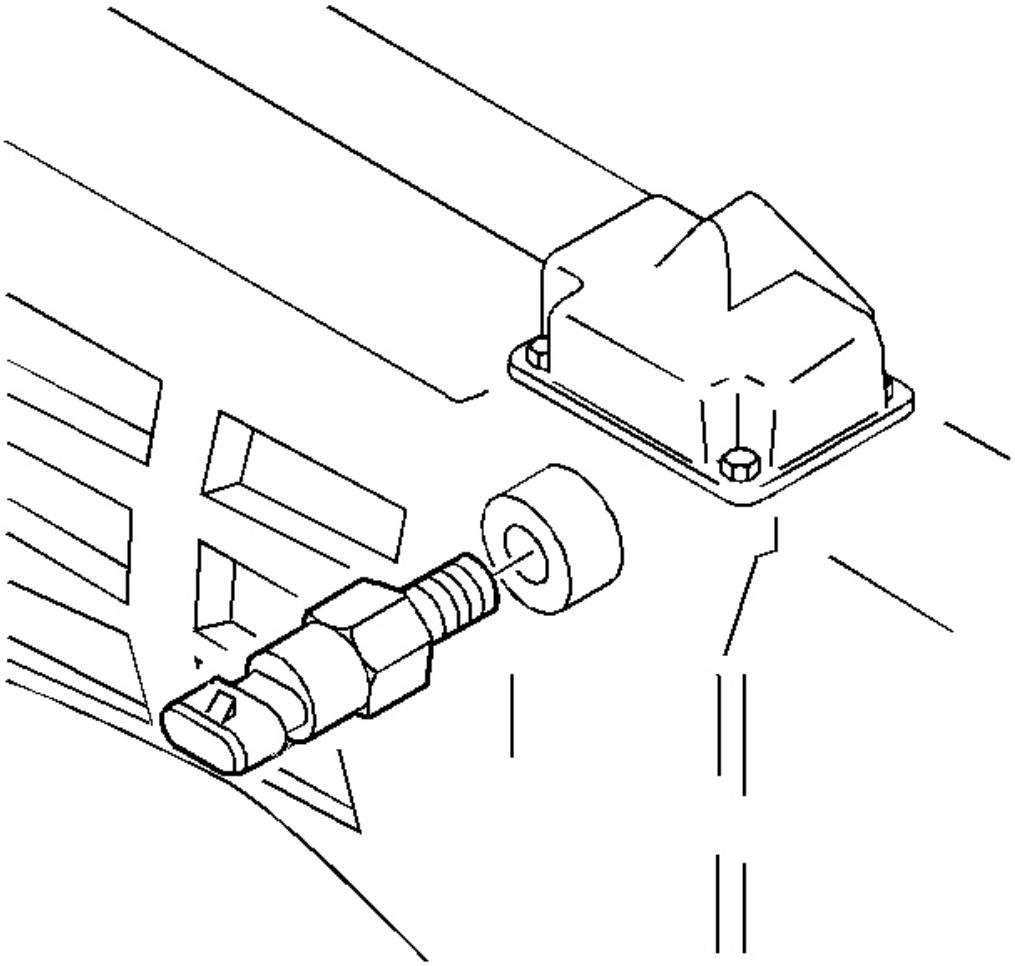


Fig. 207: Identifying Computer Aided Gear Select Solenoid
Courtesy of GENERAL MOTORS CORP.

1. Remove the computer aided gear select solenoid.

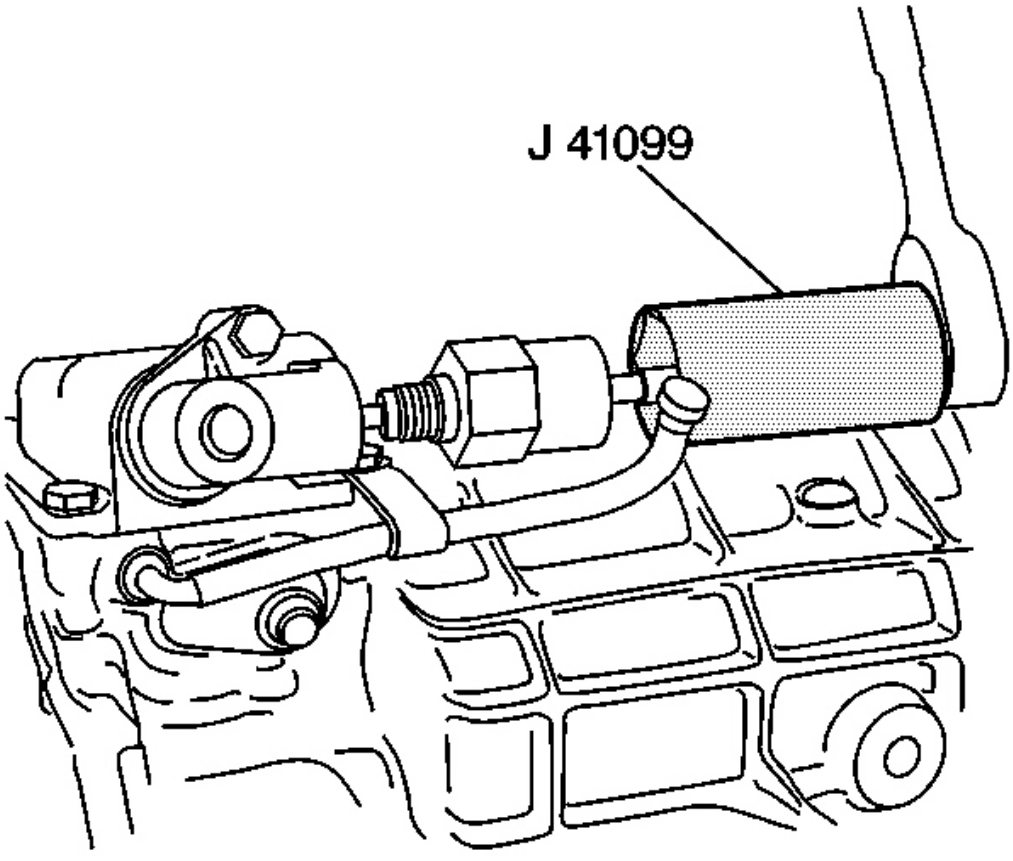


Fig. 208: J 41099 & Reverse Lockout Solenoid
Courtesy of GENERAL MOTORS CORP.

2. Remove the reverse lockout solenoid from the reverse lockout body. Use the **J 41099** . See **Special Tools**.

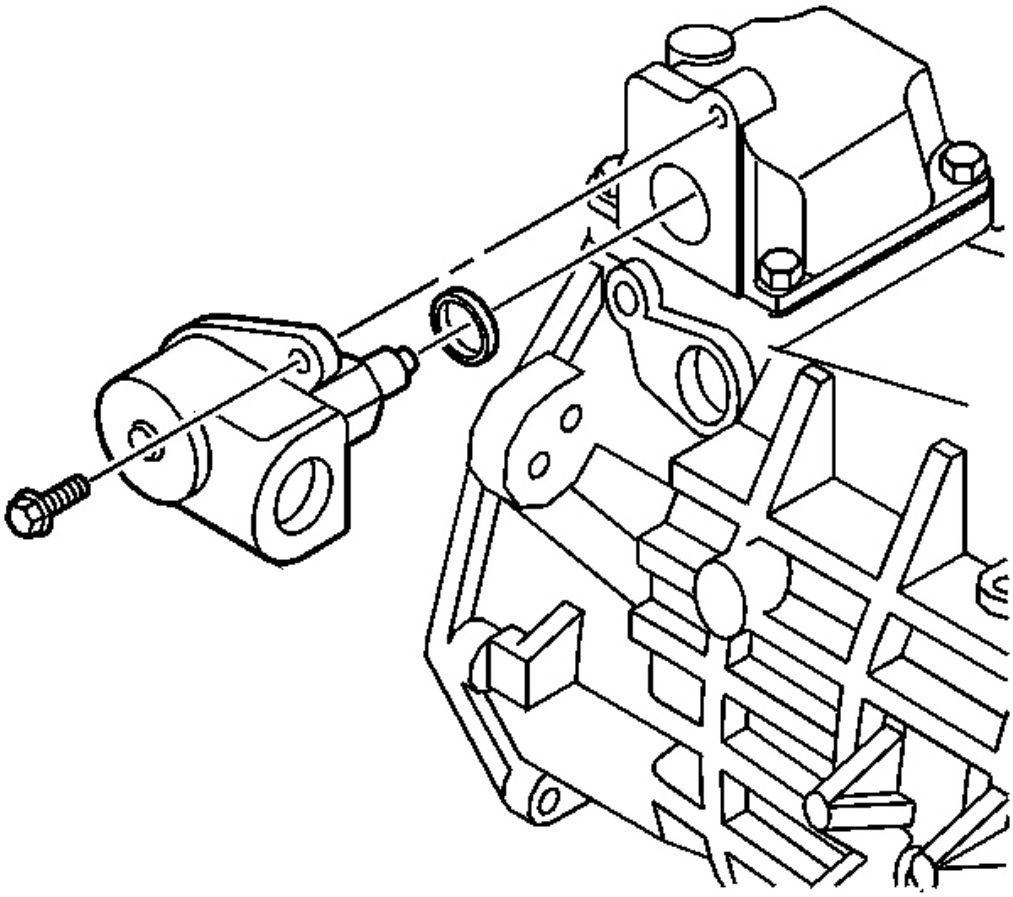


Fig. 209: View Of Reverse Lockout Body & Bolt
Courtesy of GENERAL MOTORS CORP.

3. Remove the reverse lockout assembly bolt and the reverse lockout body.

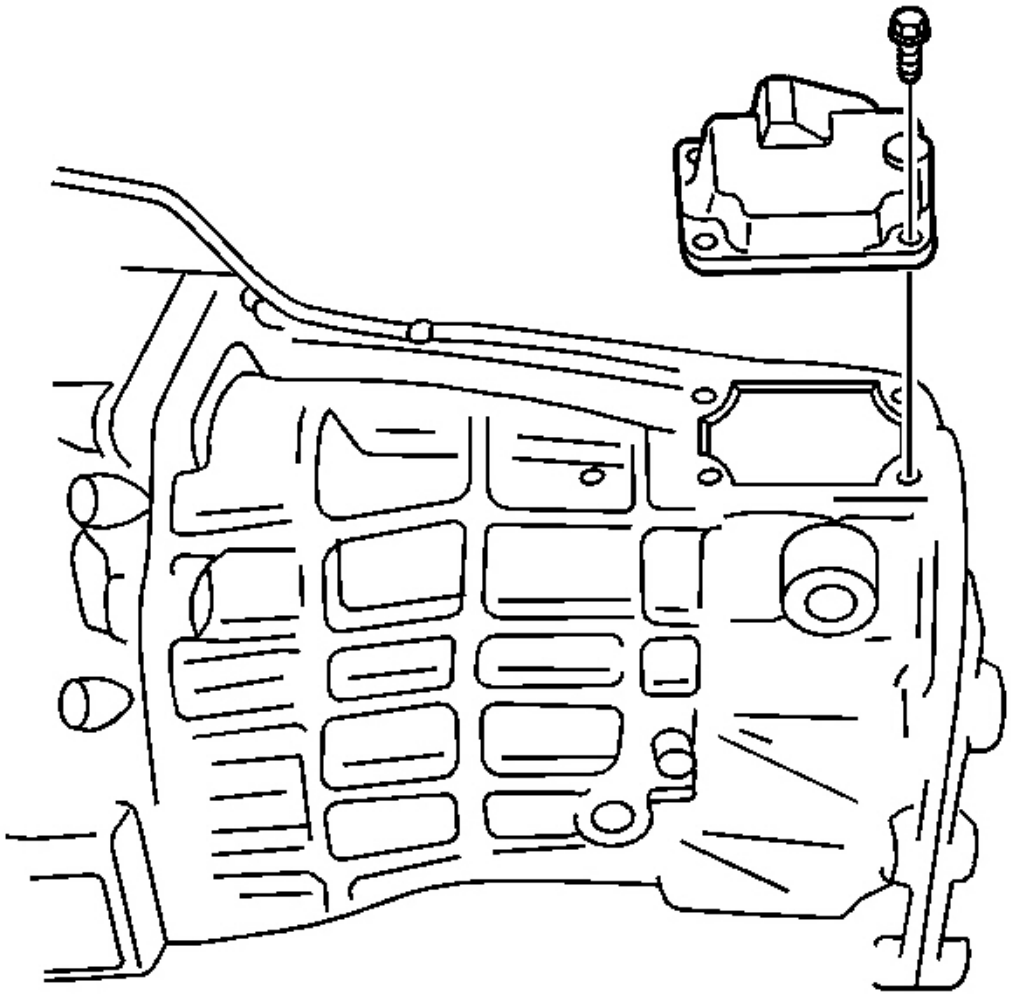


Fig. 210: View Of Shifter Cover Plate & Retainer Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the shifter cover plate retainer bolts.
5. Remove the shifter cover plate.

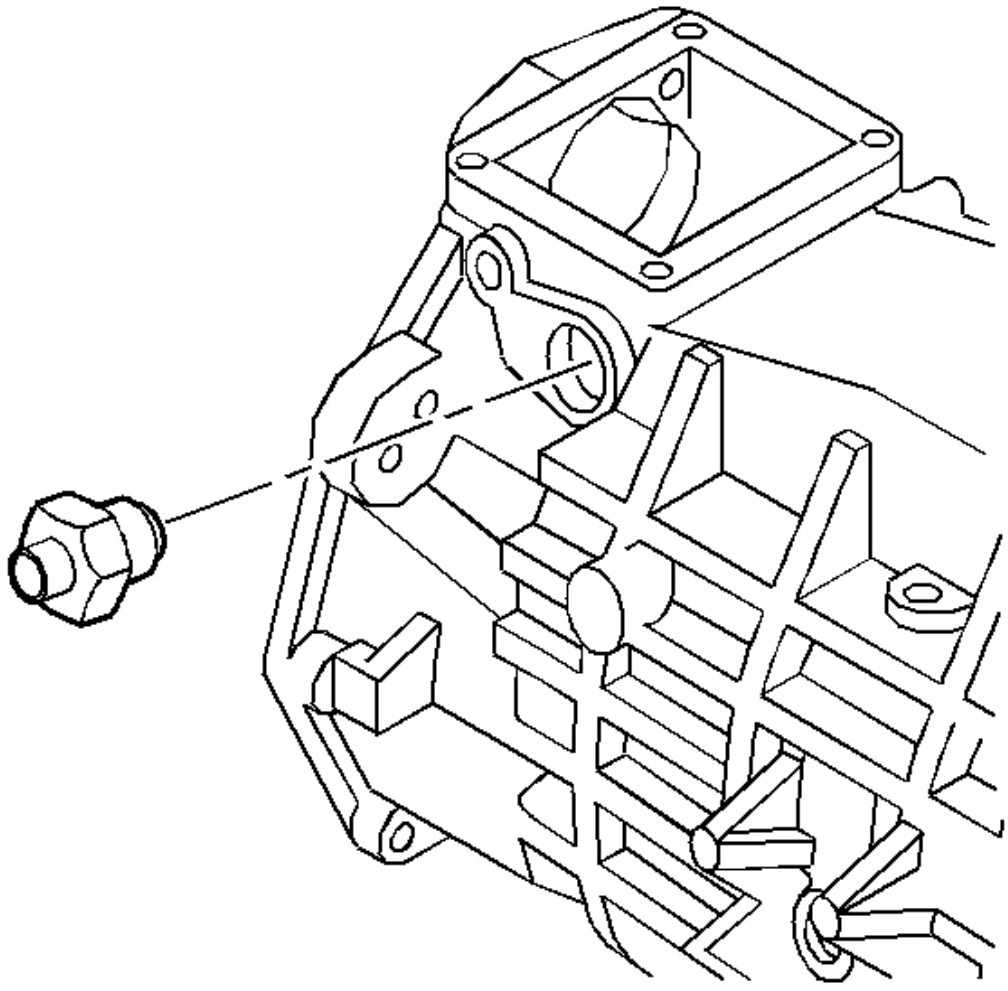


Fig. 211: View Of Shift Detent Assembly
Courtesy of GENERAL MOTORS CORP.

6. Remove the shift detent assembly.

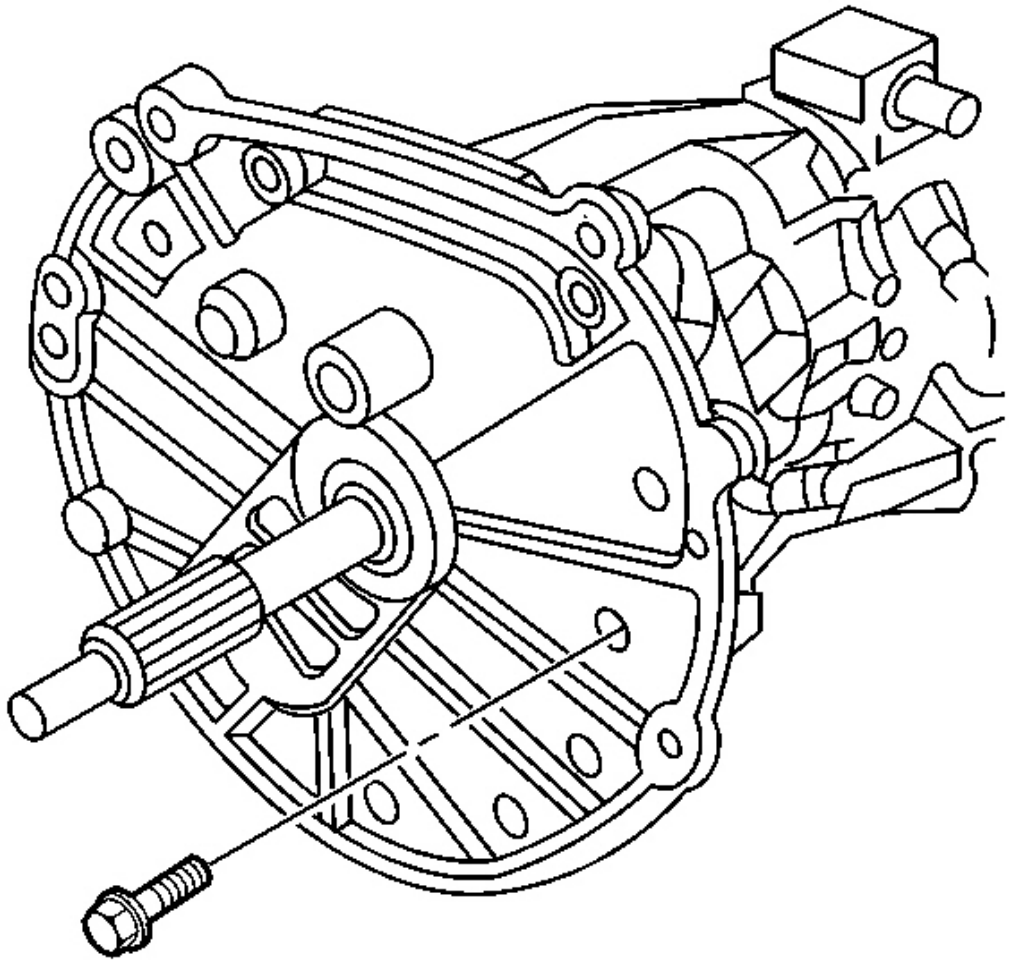


Fig. 212: View Of Adapter Plate & Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove 9 of the 11 adapter plate to transmission case bolts.
8. Rotate the transmission into the vertical position.

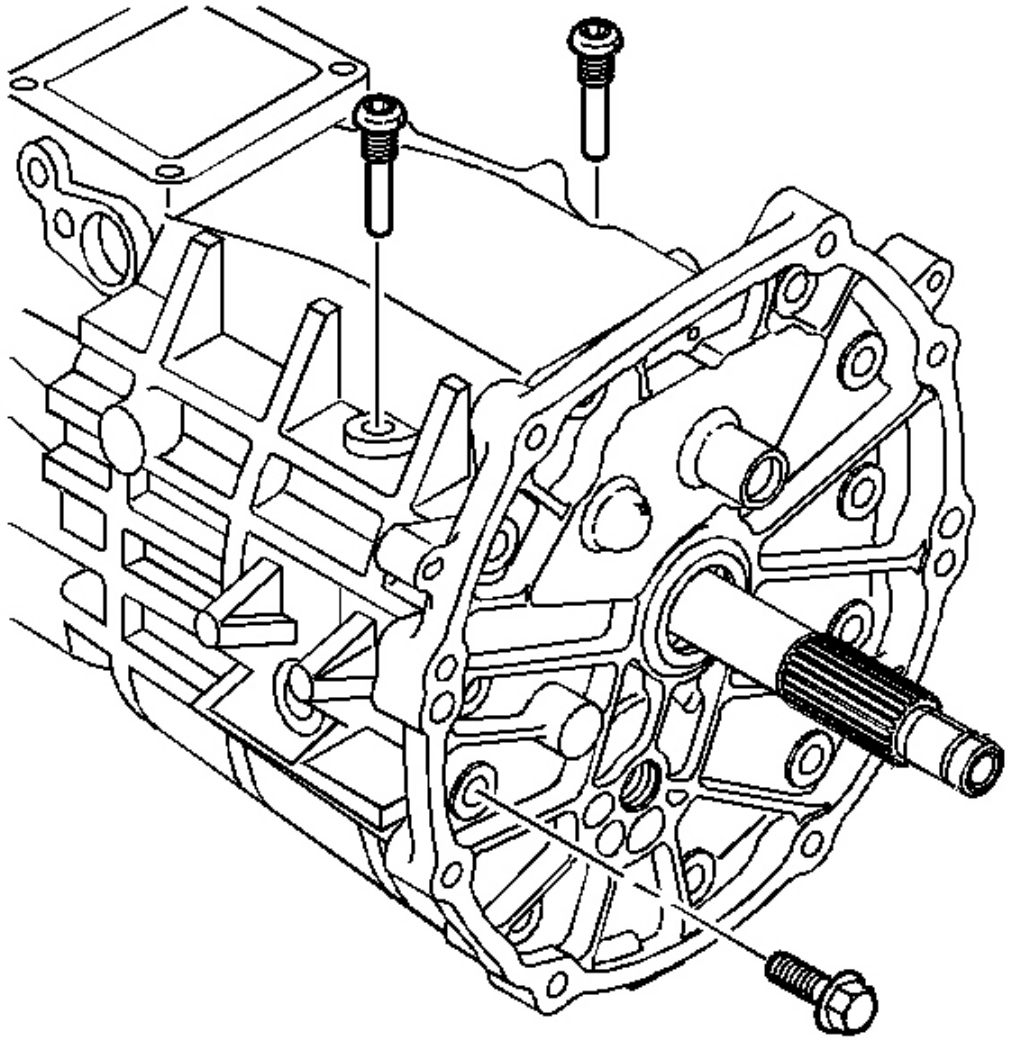


Fig. 213: View Of Adapter Plate Bolts & Shift Lever Guide Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the last 2 adapter plate to transmission case bolts.
10. Remove the shift lever guide bolts.

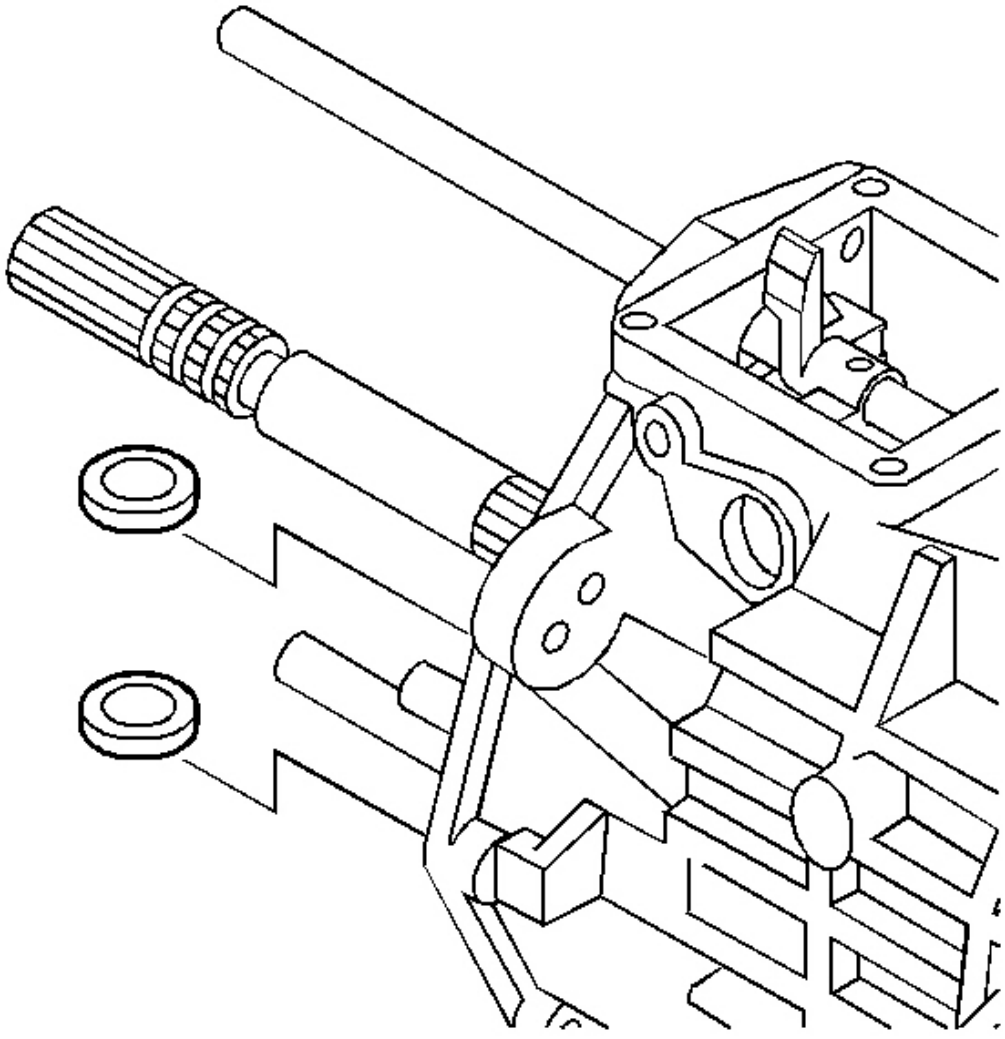


Fig. 214: View Of Transmission Magnets
Courtesy of GENERAL MOTORS CORP.

11. Remove the magnets from the transmission case.

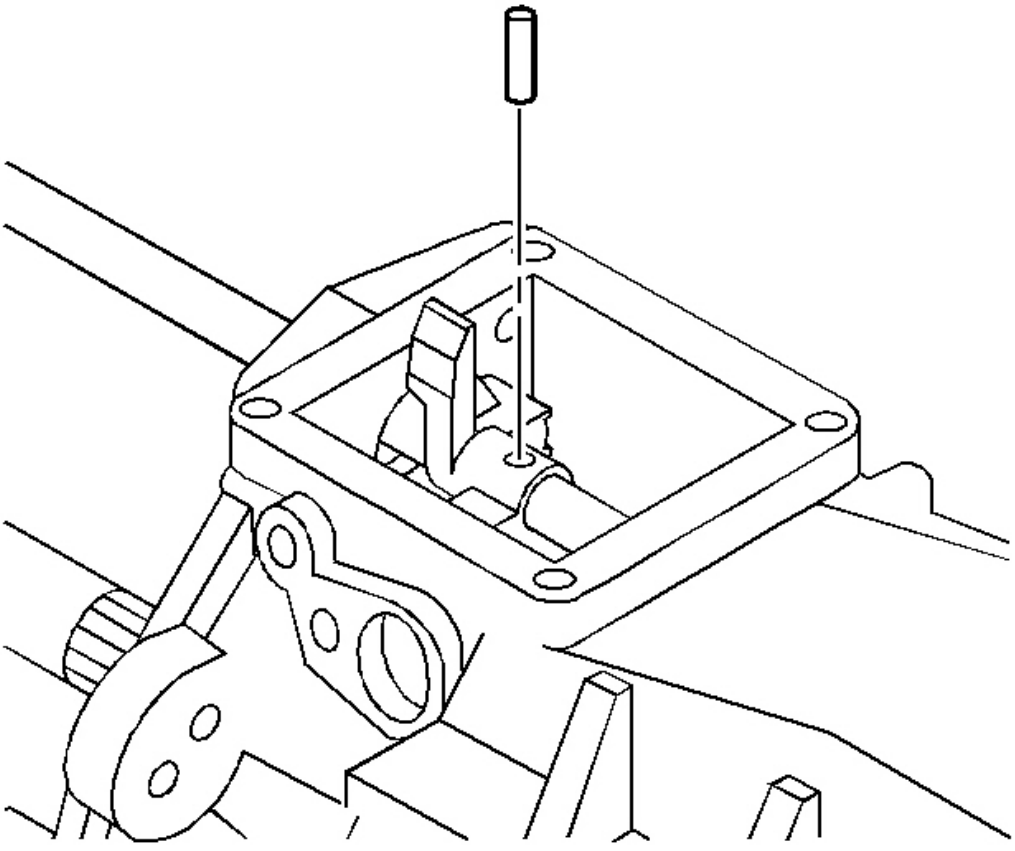


Fig. 215: View Of Offset Lever Roll Pin
Courtesy of GENERAL MOTORS CORP.

12. Remove the offset lever roll pin by using a punch to push the pin through the shift shaft.

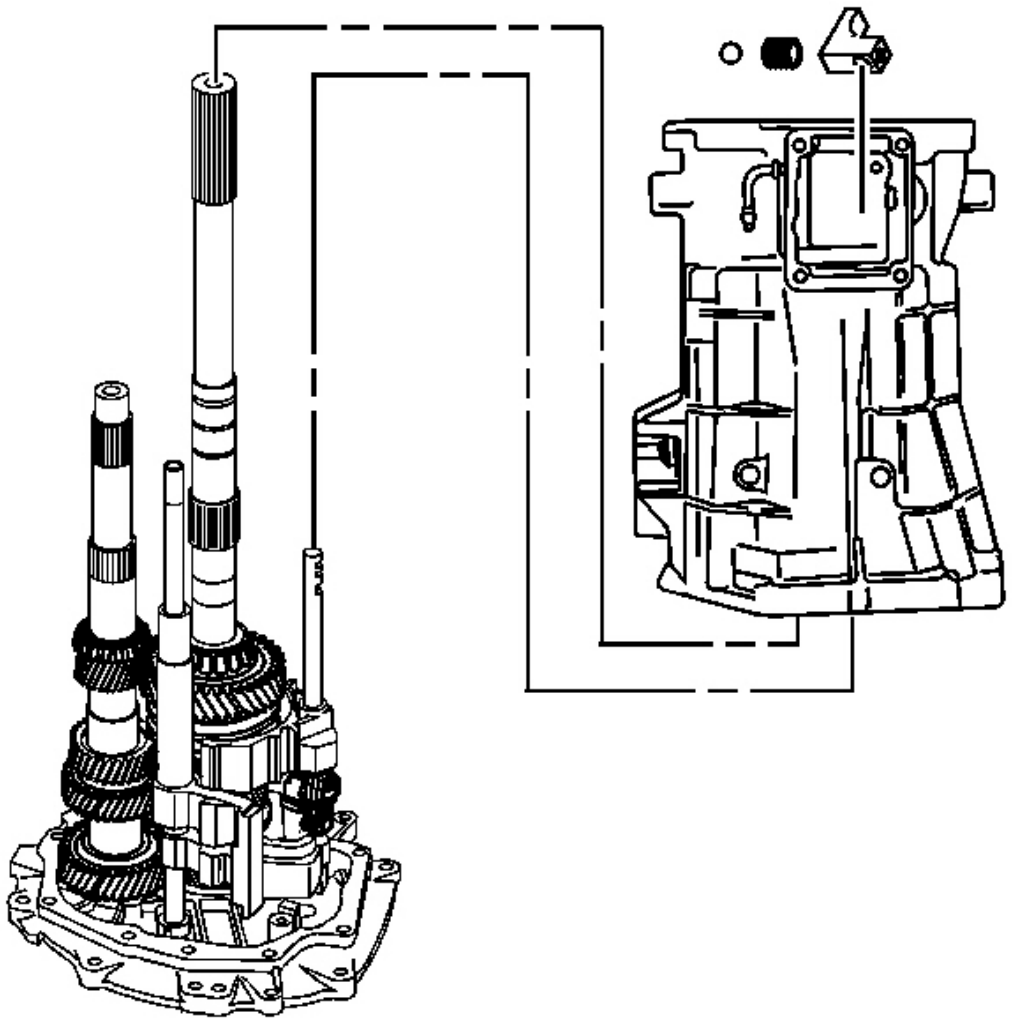


Fig. 216: View Of Transmission Case & Components
Courtesy of GENERAL MOTORS CORP.

13. Remove the transmission case and the offset lever together as follows:
    1. Slide the transmission case up and off of the gear clusters and the shift shaft components.
    2. Hold the offset lever against the guide plate in order to prevent the release of the detent ball and the spring.
    3. Remove the offset lever from the transmission case.

Guide Plate Removal

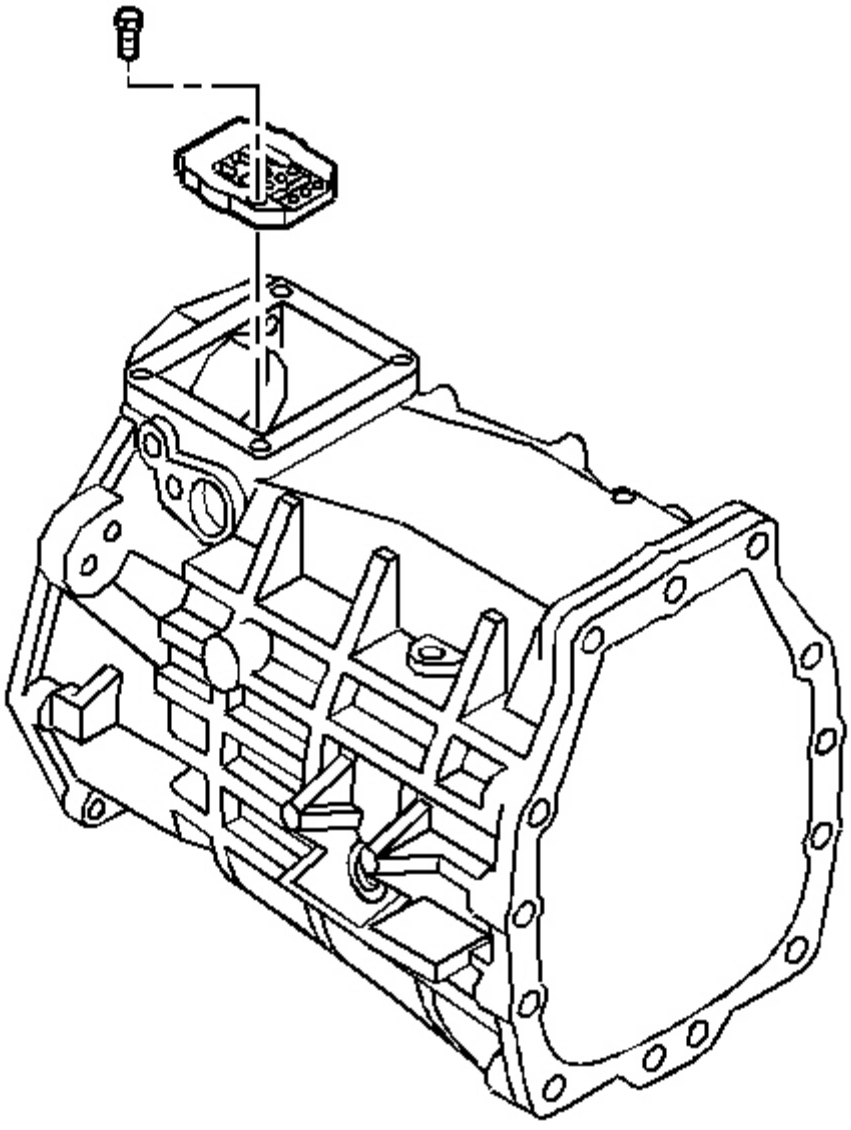


Fig. 217: Locating Detent Guide Plate & Attaching Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the detent guide plate attaching bolts.
2. Remove the detent guide plate.

Reverse Lockout Assembly Disassemble

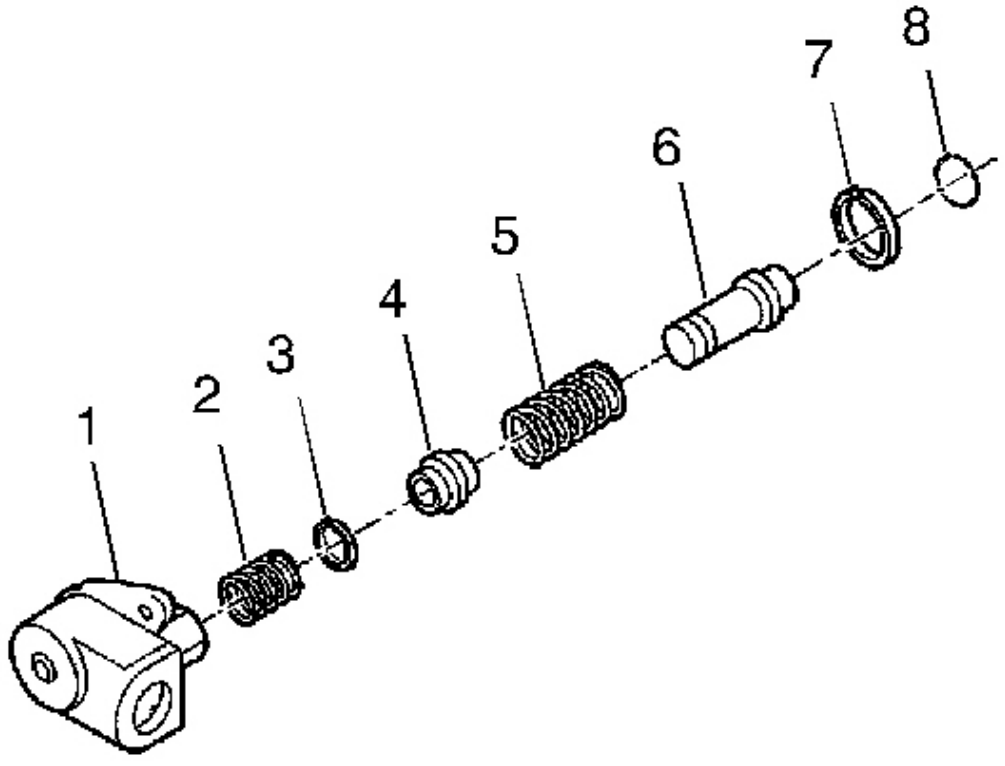


Fig. 218: Exploded View Of Reverse Lockout Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: The reverse lockout assembly is under spring pressure. Exercise caution when removing the retainer ring, as bodily injury may result.

1. Remove the O-ring (8) from the body (1).
2. Remove the retainer ring (7) from the body (1).
3. Remove the reverse lockout inner spring (2).
4. Compress the reverse lockout plunger (6) and the collar (4) in a vise and remove the retainer ring (3).
5. Remove the reverse lockout plunger (6).

6. Remove the reverse lockout outer spring (5).
7. Remove the reverse lockout collar (4).

Shift Shaft Assemblies and Gear Cluster Removal

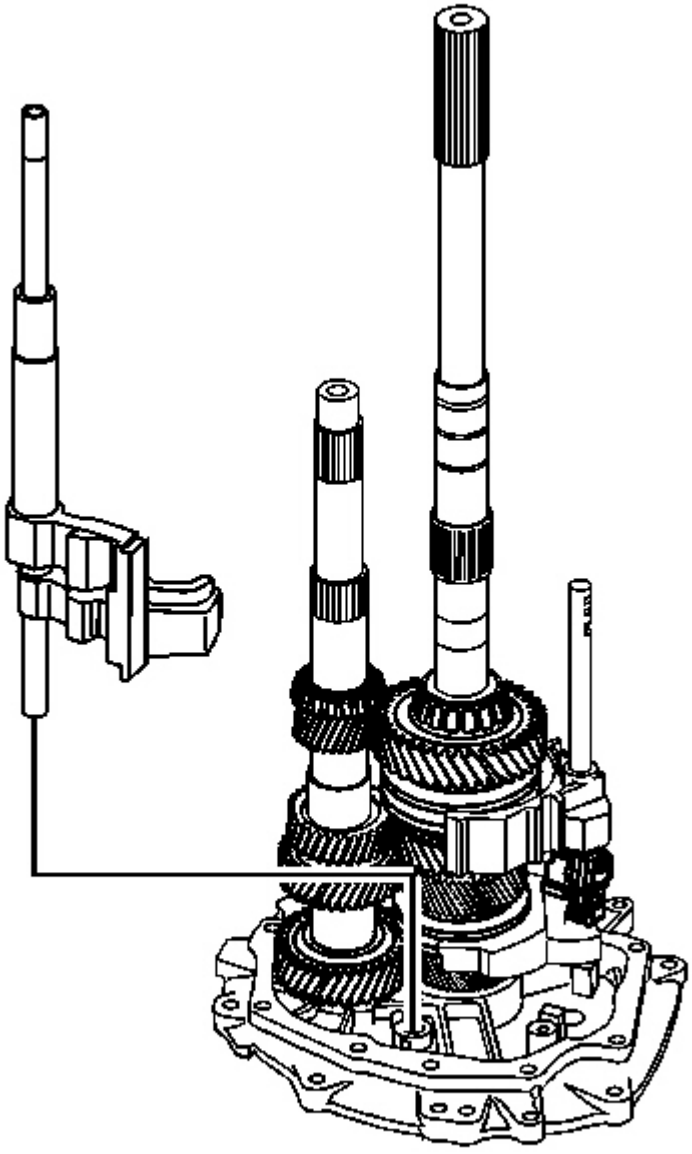


Fig. 219: View Of 5th/6th & Reverse Shift Shaft Assembly

Courtesy of GENERAL MOTORS CORP.

1. Rotate the 5th/6th and the reverse shift shaft levers off the shift interlock plate.
2. Remove the 5th/6th and the reverse shift shaft assembly.

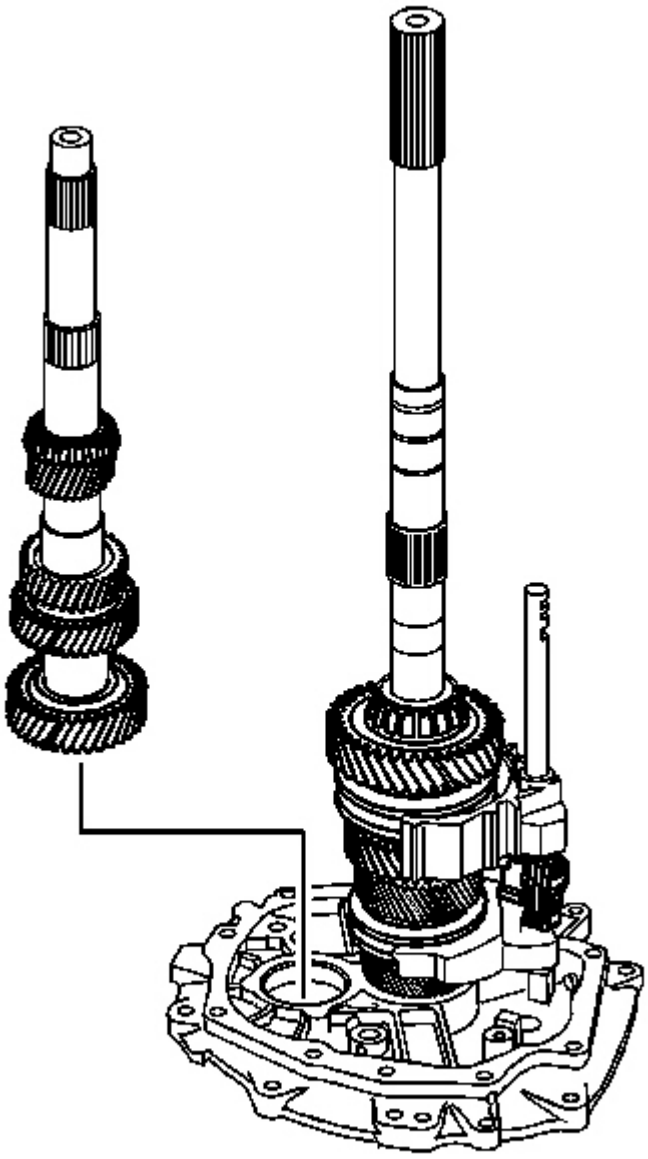


Fig. 220: View Of Countershaft

Courtesy of GENERAL MOTORS CORP.

3. Remove the countershaft. Lift up the mainshaft enough in order to remove the countershaft.

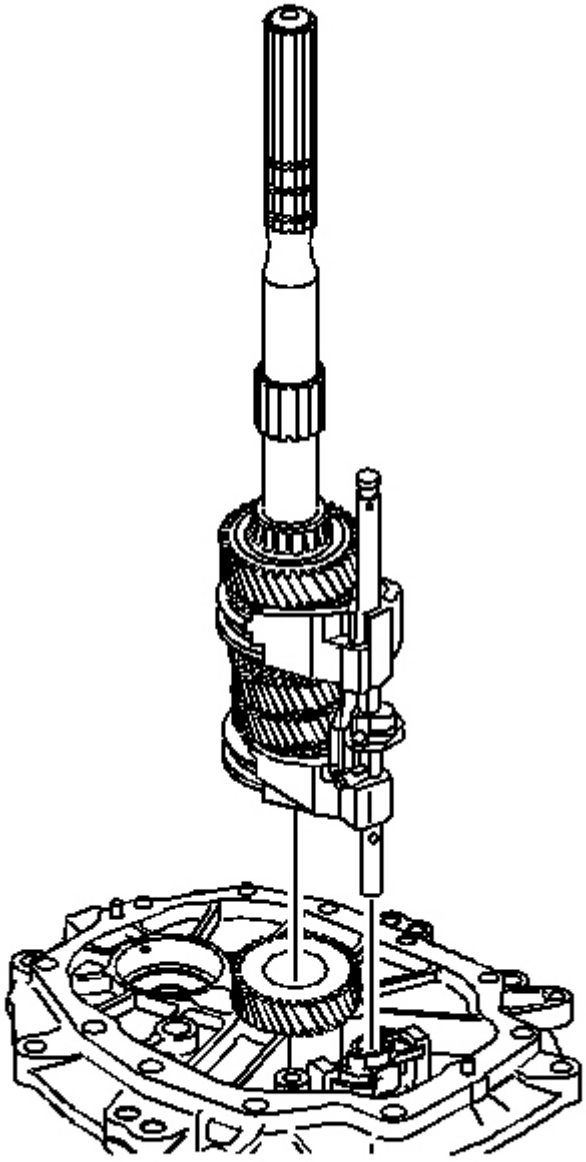


Fig. 221: View Of Mainshaft Assembly & Shift Shaft Components
Courtesy of GENERAL MOTORS CORP.

4. Remove the mainshaft and the shift shaft components as an assembly.

IMPORTANT: When removing the shift shaft be careful not to lose the dowel pin.

5. Remove the shift shaft assembly from the mainshaft.

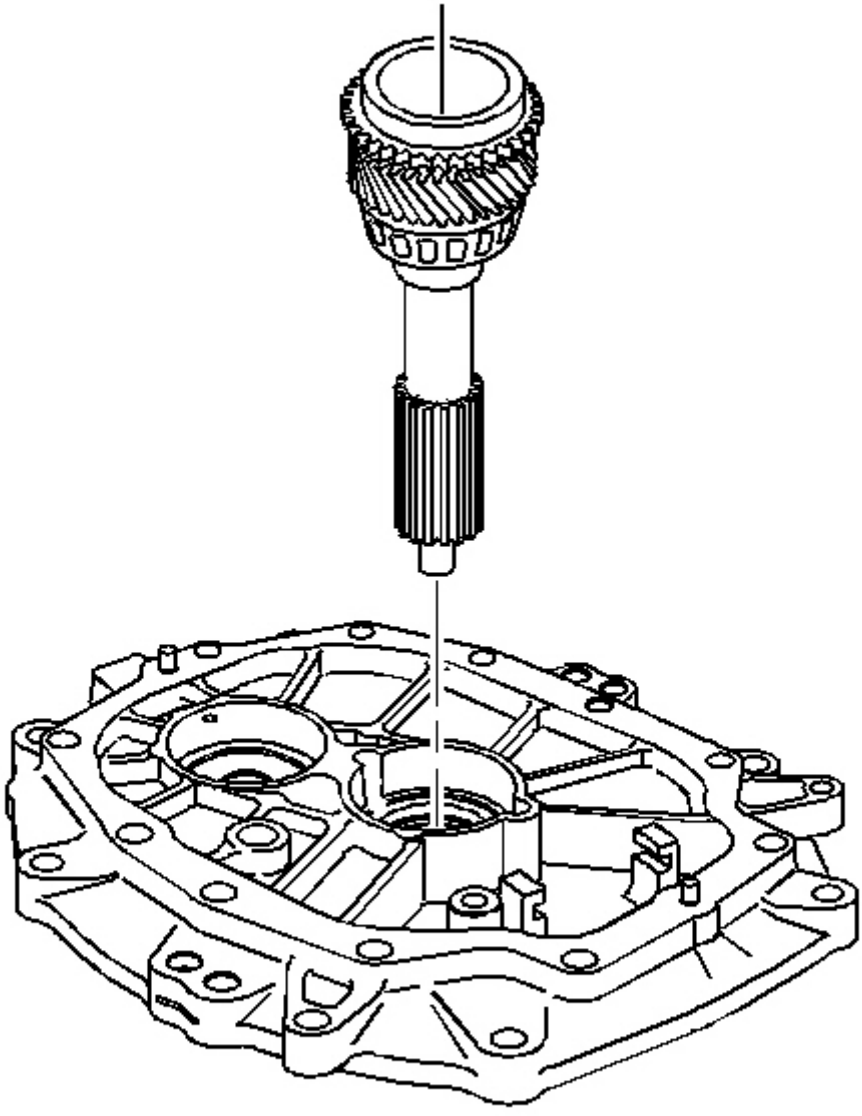


Fig. 222: View Of Input Shaft
Courtesy of GENERAL MOTORS CORP.

6. Remove the input shaft.

MAIN SHAFT AND INPUT SHAFT DISASSEMBLE

Mainshaft

Tools Required

- **J 36513** Split Plate. See **Special Tools**.
- **J 39442** Press Adapter. See **Special Tools**.
- **J 39443** Split Plate. See **Special Tools**.
- **J 39473** Mainshaft Bearing Installer. See **Special Tools**.

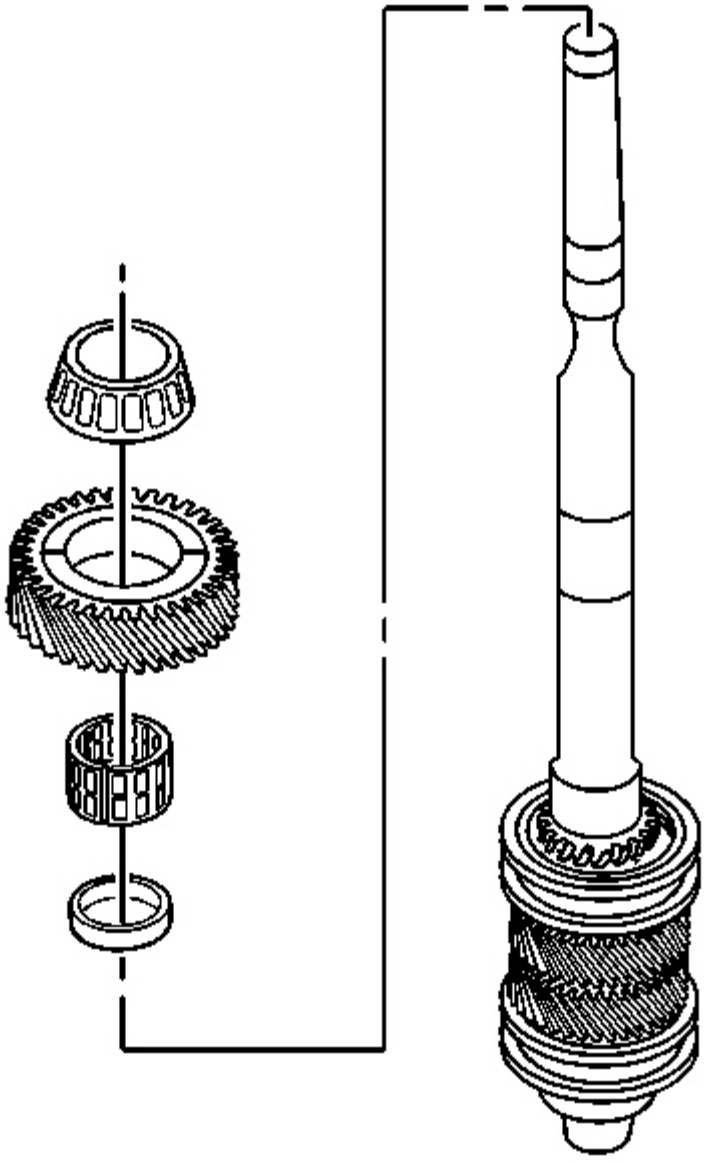


Fig. 223: View Of 1st Speed Gear Components
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Measure the 4th speed gear synchronizer wear gap before disassembling the mainshaft.

1. Install the input shaft in the adapter plate.
2. Install the mainshaft on the input shaft.
3. Using a feeler gauge measure the gap between the 4th speed gear blocking ring and the 4th speed gear.
4. Replace the 4th speed gear friction cone and blocking ring when the gap is less than 1.27 mm (0.050 in).

NOTE: Do not overtighten the J 36513 split plate past the gear teeth or damage to gear may occur.

5. Using the **J 36513** , close the split plate only enough to support the gear teeth, and the **J 39442** , remove the following parts in order. See **Special Tools**.
    1. If an O-ring is present on the mainshaft, remove and discard the O-ring. The O-ring was used for manufacturing purposes only.
    2. The mainshaft large tapered bearing
    3. The 1st speed gear
    4. The 1st speed gear caged needle bearing
    5. The 1st speed bearing spacer

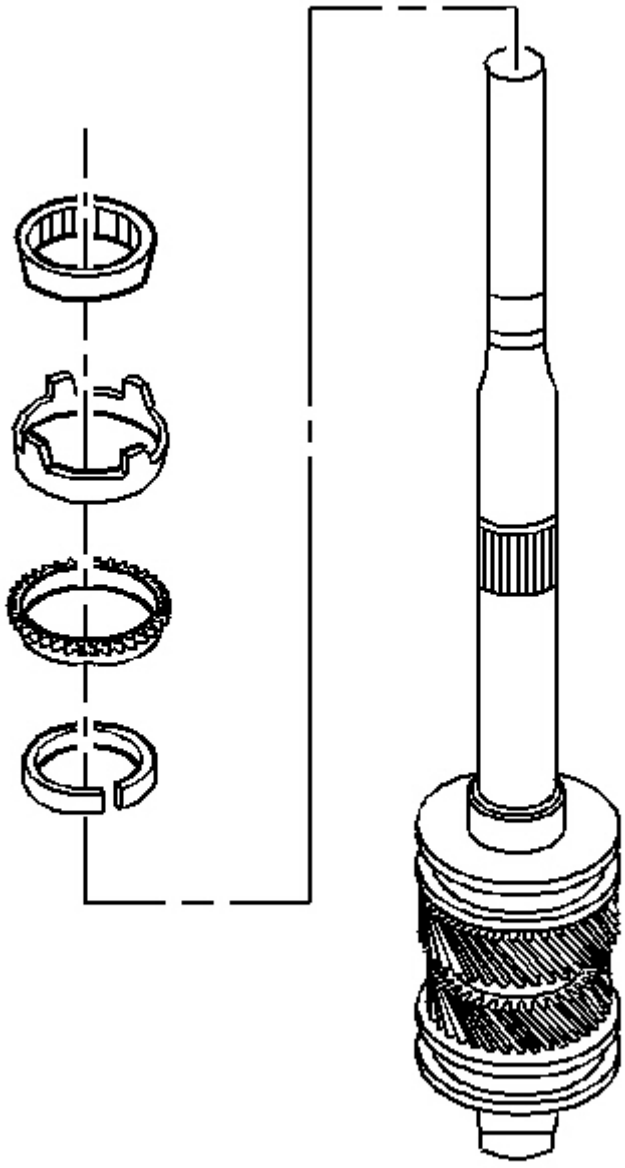


Fig. 224: View Of 1st Speed Gear Cones & Rings
Courtesy of GENERAL MOTORS CORP.

6. Remove the following parts in order:
    1. The 1st speed gear inner cone

2. The 1st speed gear friction cone
3. The 1st speed gear blocking ring
4. The retainer ring

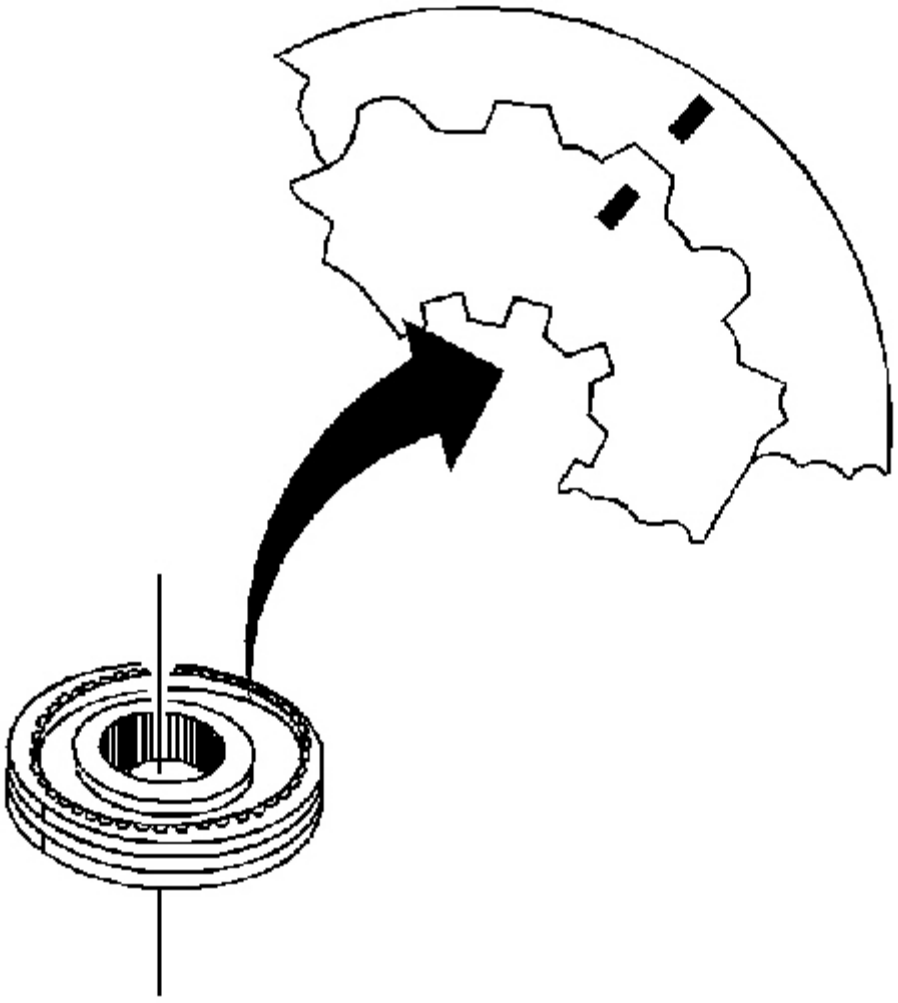


Fig. 225: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The synchronizer hubs and sliding sleeves are a selected

assembly. Keep these parts together as originally assembled.

7. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.

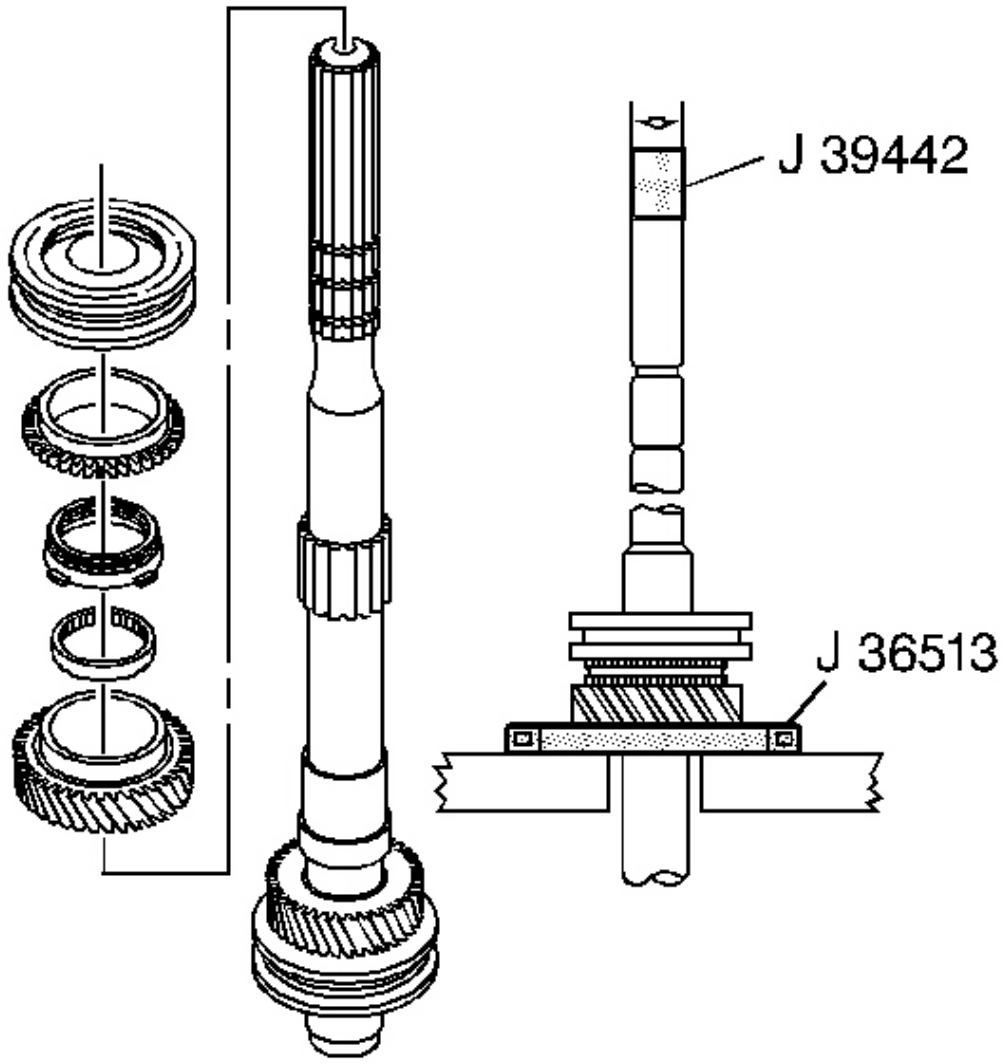


Fig. 226: Locating 2nd Speed Gear Assembly
Courtesy of GENERAL MOTORS CORP.

8. Remove the 2nd speed gear. The 1st/2nd speed synchronizer assembly, the 2nd speed gear blocking ring, the 2nd speed gear friction cone, and the 2nd speed gear inner cone will press off with the 2nd speed gear. Use the **J 36513** in an inverted position, **J 39442** and a hydraulic press. See **Special Tools**.

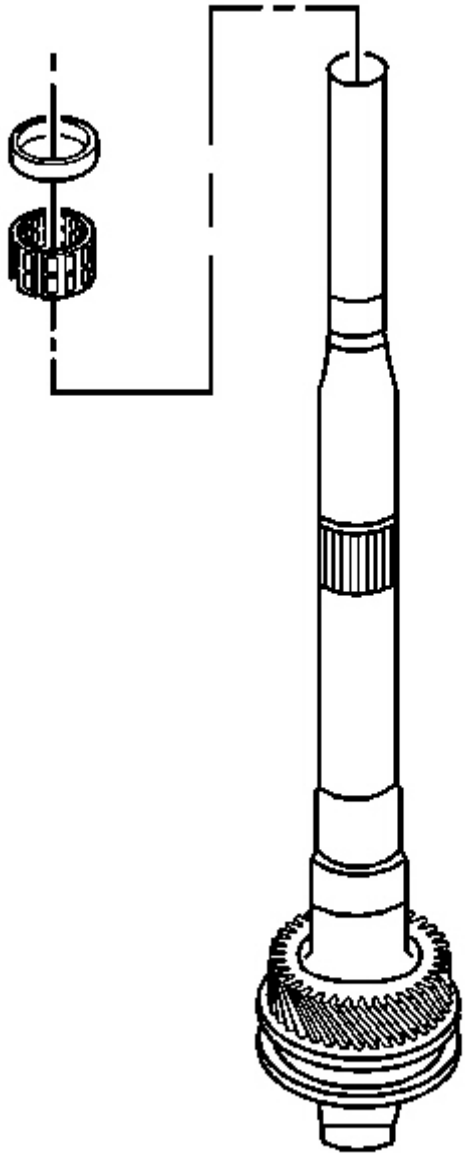


Fig. 227: View Of 2nd Speed Gear Caged Needle Bearing & Bearing Spacer
Courtesy of GENERAL MOTORS CORP.

9. Remove the 2nd speed gear spacer and caged needle bearing.

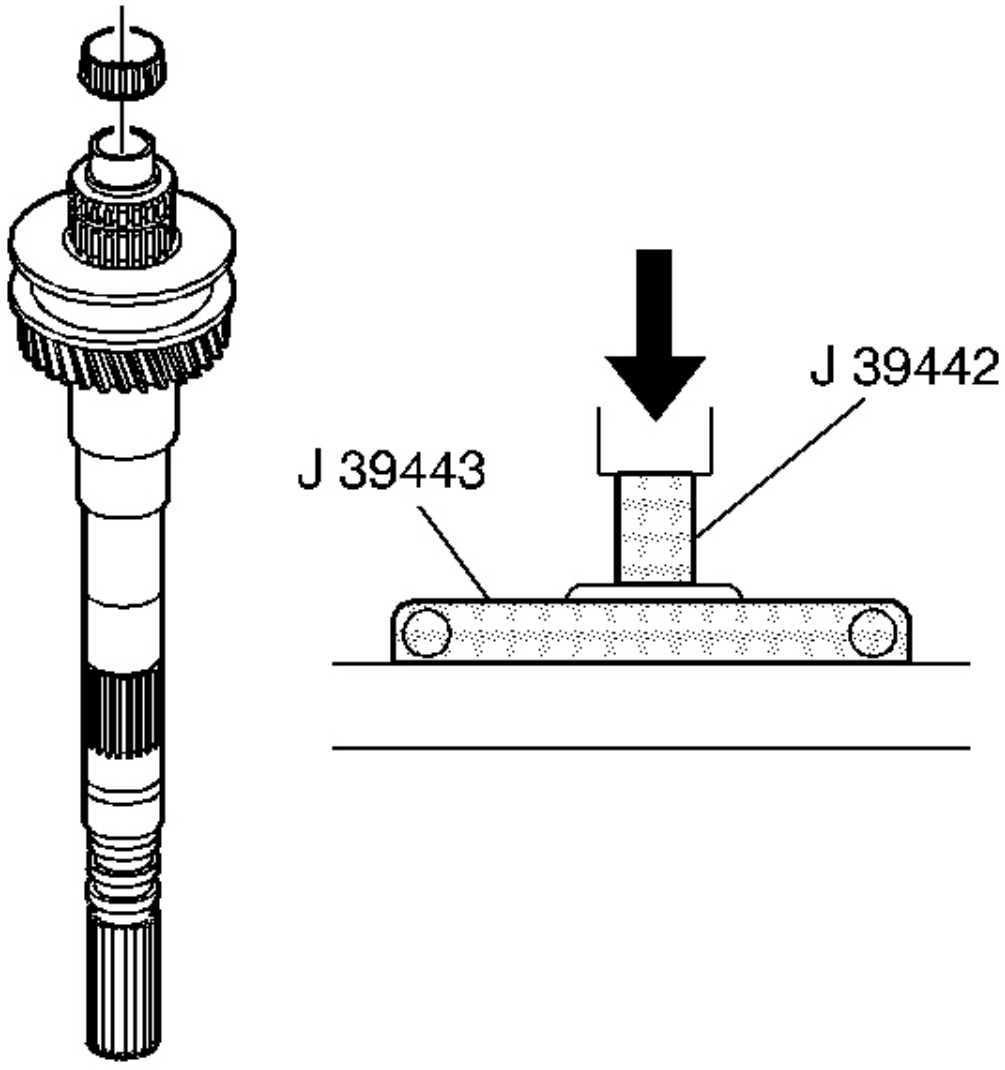


Fig. 228: Removing Mainshaft Small Tapered Bearing Using J 39442 & J 39443
Courtesy of GENERAL MOTORS CORP.

10. Remove the mainshaft small tapered bearing. Use the **J 39442** , the **J 39443** , and a hydraulic press. See **Special Tools**.
11. Discard the small tapered bearing.

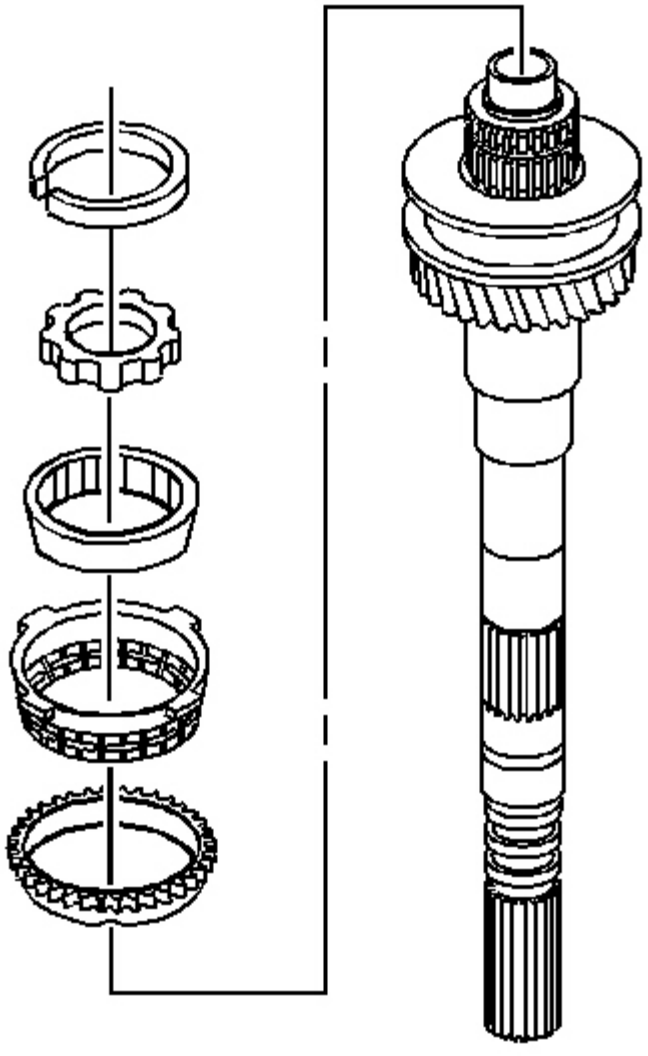


Fig. 229: Exploded View Of 4th Gear Assembly
Courtesy of GENERAL MOTORS CORP.

12. Remove the following parts in order:

1. Retainer
2. 4th gear thrust washer
3. 4th gear inner cone
4. 4th gear friction cone
5. 4th gear blocking ring

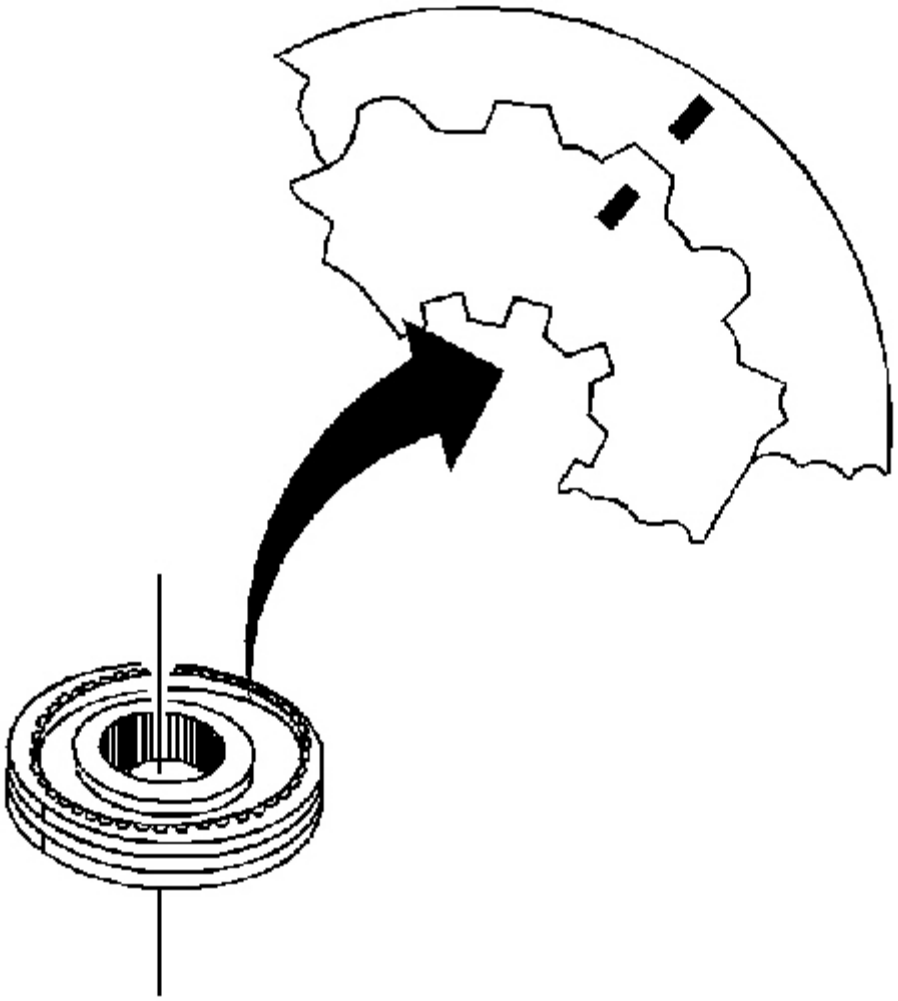


Fig. 230: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The synchronizer hubs and sliding sleeves are a selected assembly. Keep these parts together as originally assembled.

13. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.

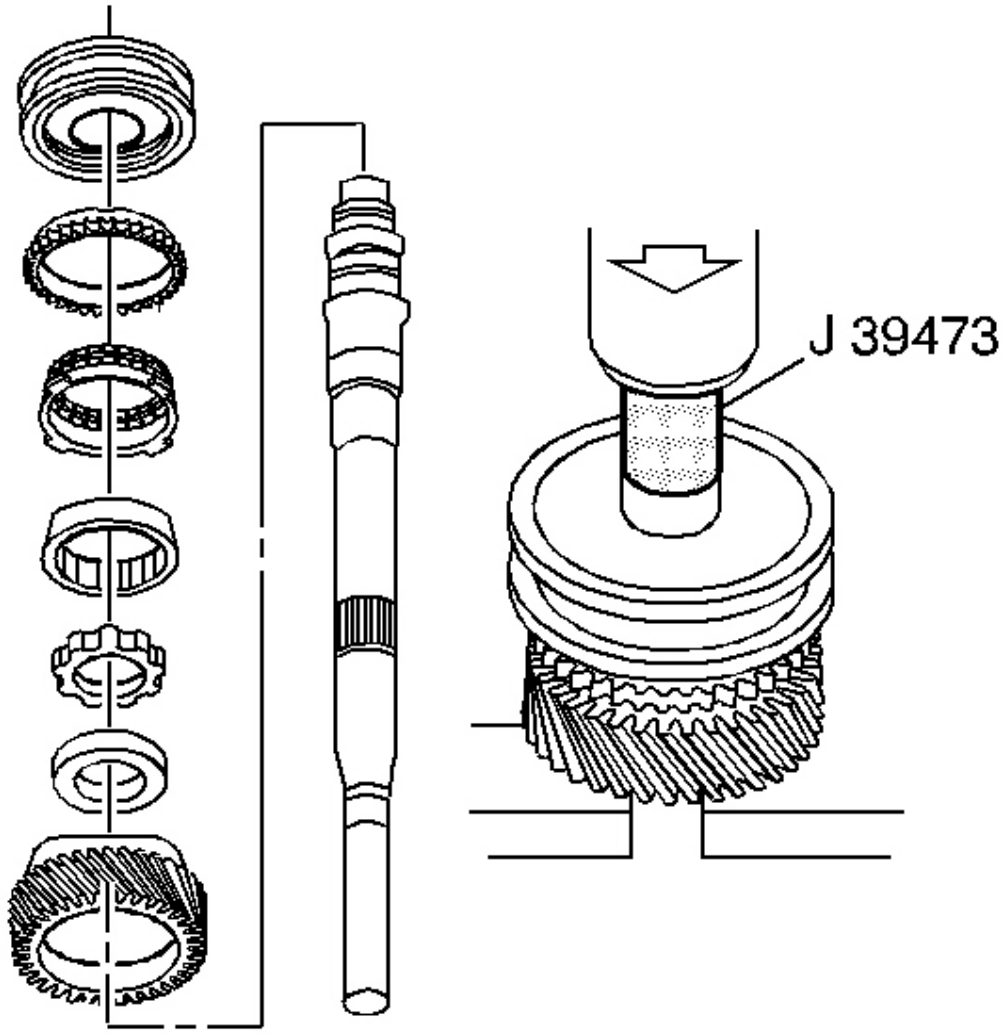


Fig. 231: Identifying 3rd/4th Speed Synchronizer Assembly, Blocking Ring, Cones, Washer & Spacer

Courtesy of GENERAL MOTORS CORP.

14. Use the **J 39473** , V-blocks, and a hydraulic press to remove the 3rd speed gear. See **Special Tools**. The 3rd/4th speed synchronizer assembly, the 3rd speed gear blocking ring, the 3rd speed gear friction cone, the 3rd speed gear inner cone, thrust washer, and spacer will press off with the 3rd speed gear.

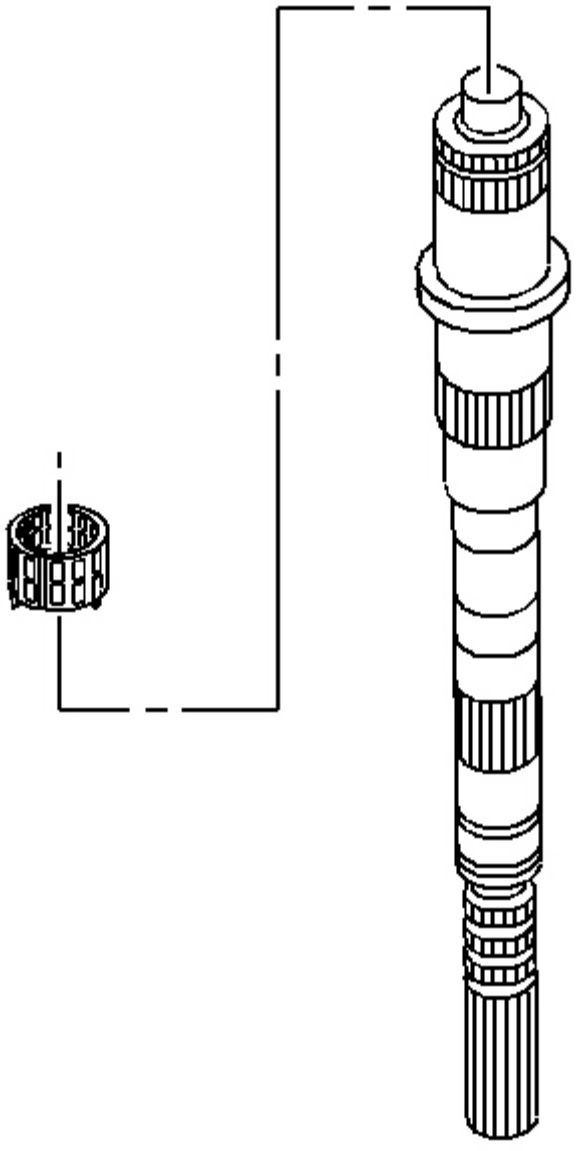


Fig. 232: View Of 3rd Speed Gear Caged Needle Bearing & Spacer
Courtesy of GENERAL MOTORS CORP.

15. Remove the 3rd speed gear caged needle bearing.

Input Shaft

Tools Required

- **J 22912-O1** Split Plate
- **J 23907** Slide Hammer
- **J 39594** Bearing Race Remover. See **Special Tools**.

IMPORTANT: Do not replace the tapered bearing or the bearing race unless inspection shows that the bearing or the race are damaged.

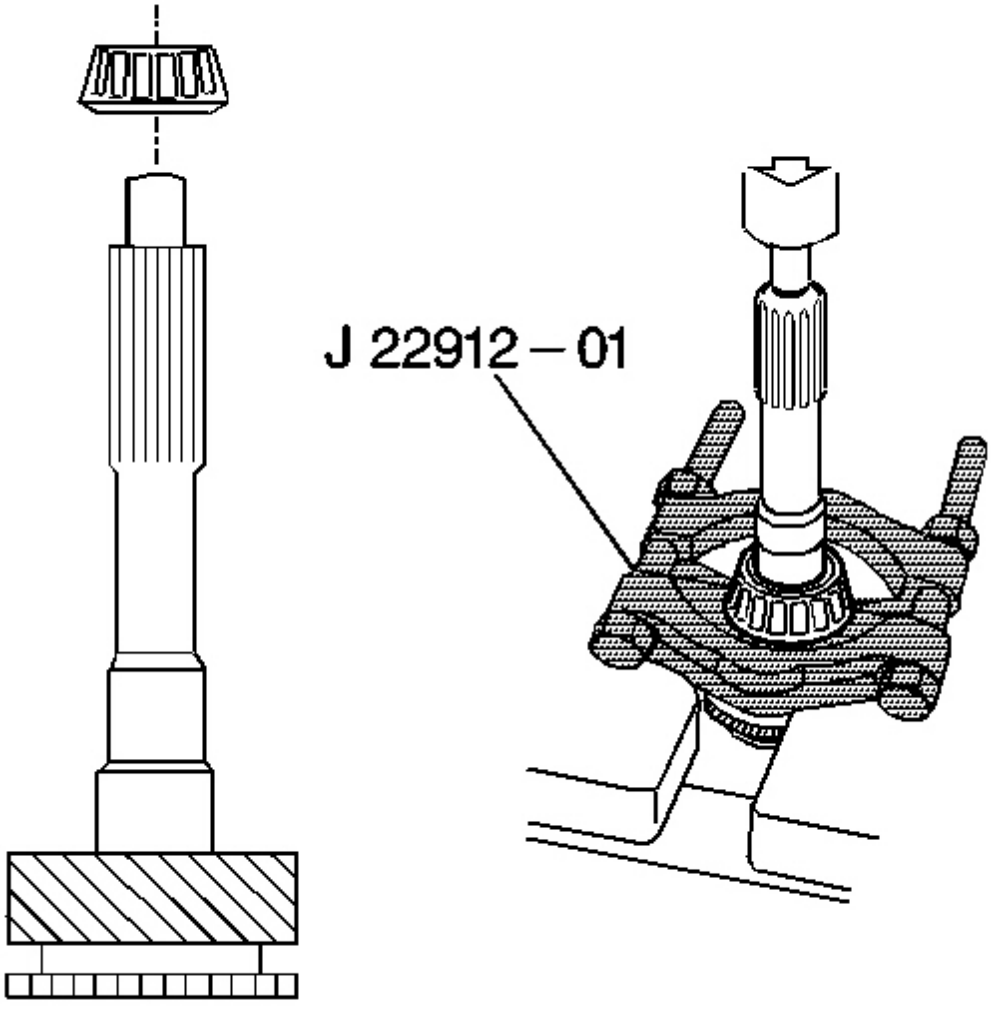


Fig. 233: Using J 22912-O1 To Remove Tapered Bearing From Input Shaft
Courtesy of GENERAL MOTORS CORP.

1. Remove the tapered bearing from the input shaft, using the **J 22912-O1** and a hydraulic press.

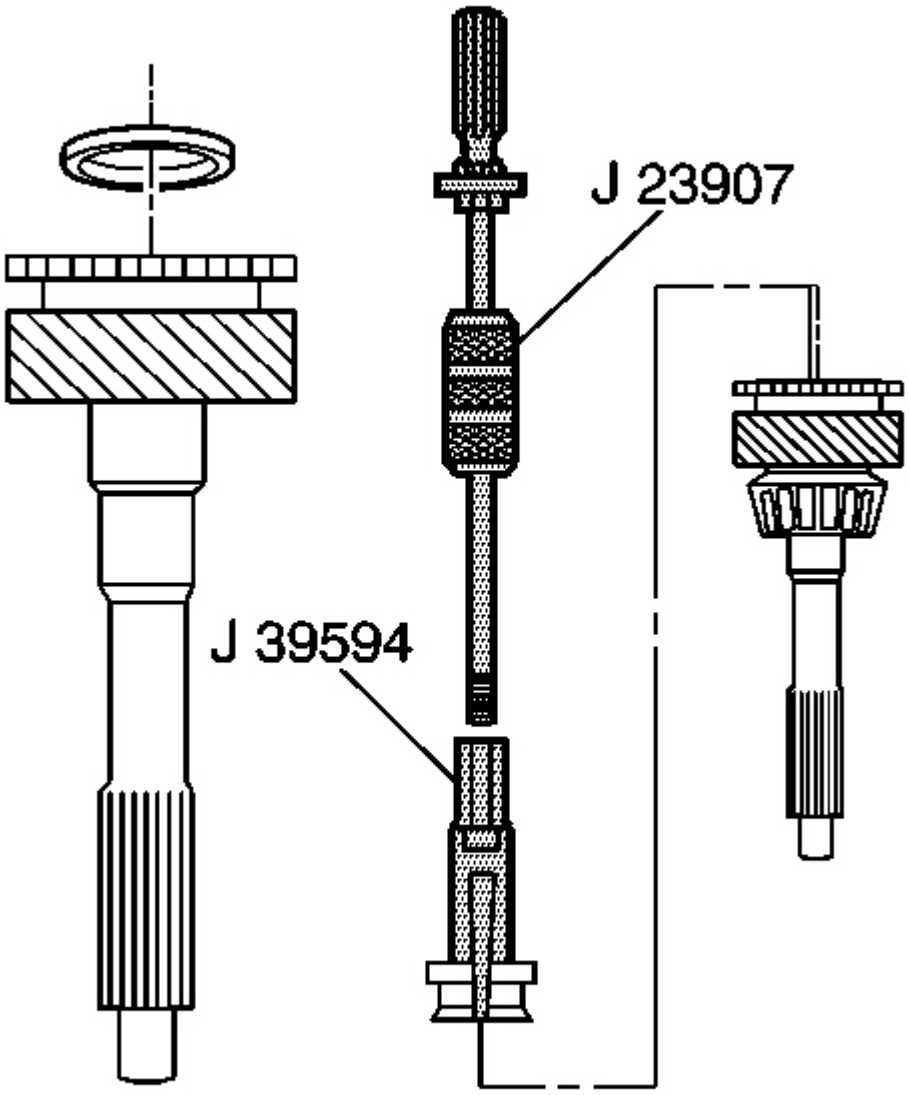


Fig. 234: View Of Bearing Race, Input Shaft, J 23907 & J 39594

Courtesy of GENERAL MOTORS CORP.

2. Remove the bearing race from the input shaft, using the **J 23907** and the **J 39594** . See **Special Tools**.

COUNTER GEAR SHAFT DISASSEMBLE (Z06 AND SSR)

Tools Required

- **J 22912-O1** Split Plate
- **J 39473** Mainshaft Bearing Installer. See **Special Tools**.
- **J 39511** Split Plate. See **Special Tools**.
- **J 39547** Press Adapter. See **Special Tools**.

IMPORTANT: Do not replace tapered bearings unless inspection shows bearing damage.

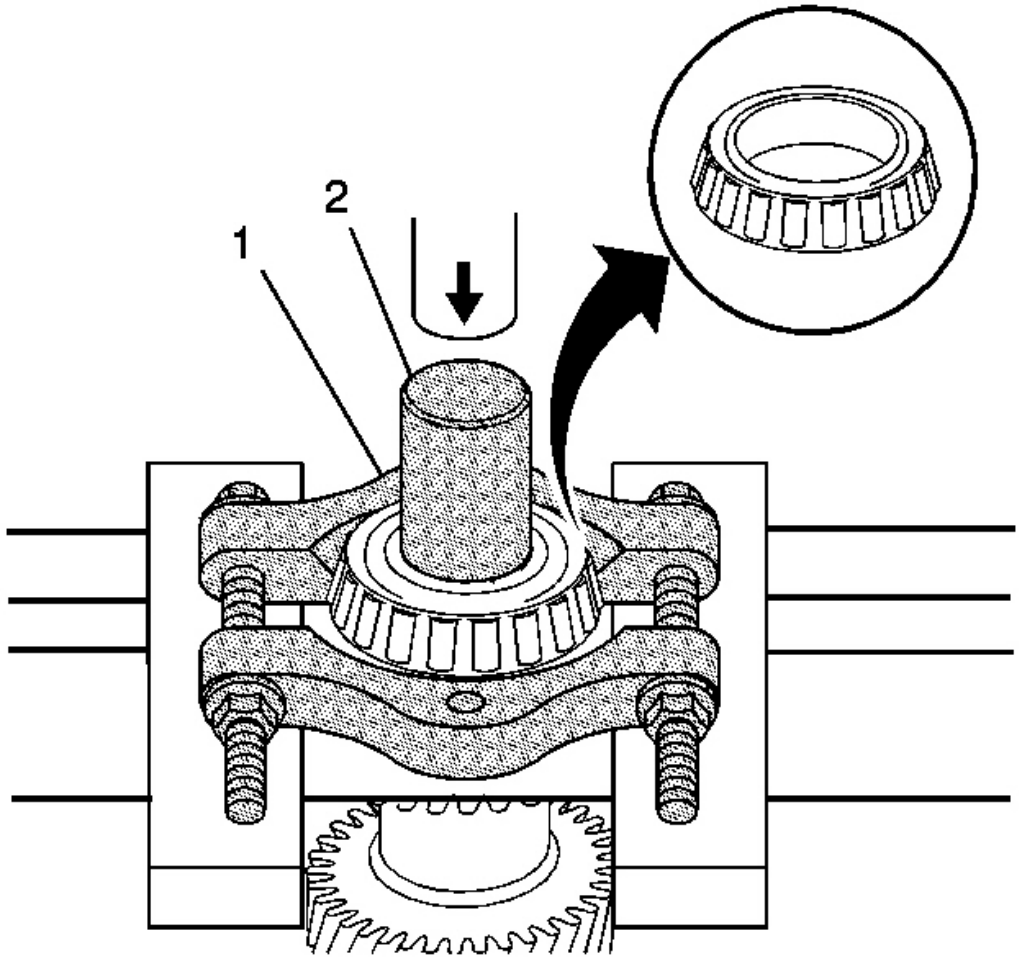


Fig. 235: View Of Special Tools J 22912-O1 & J 39473
Courtesy of GENERAL MOTORS CORP.

1. Remove the small tapered bearing, using the **J 22912-O1** (1) with the **J 39473** (2) and a hydraulic press. See **Special Tools**.
2. Discard the small tapered bearing.

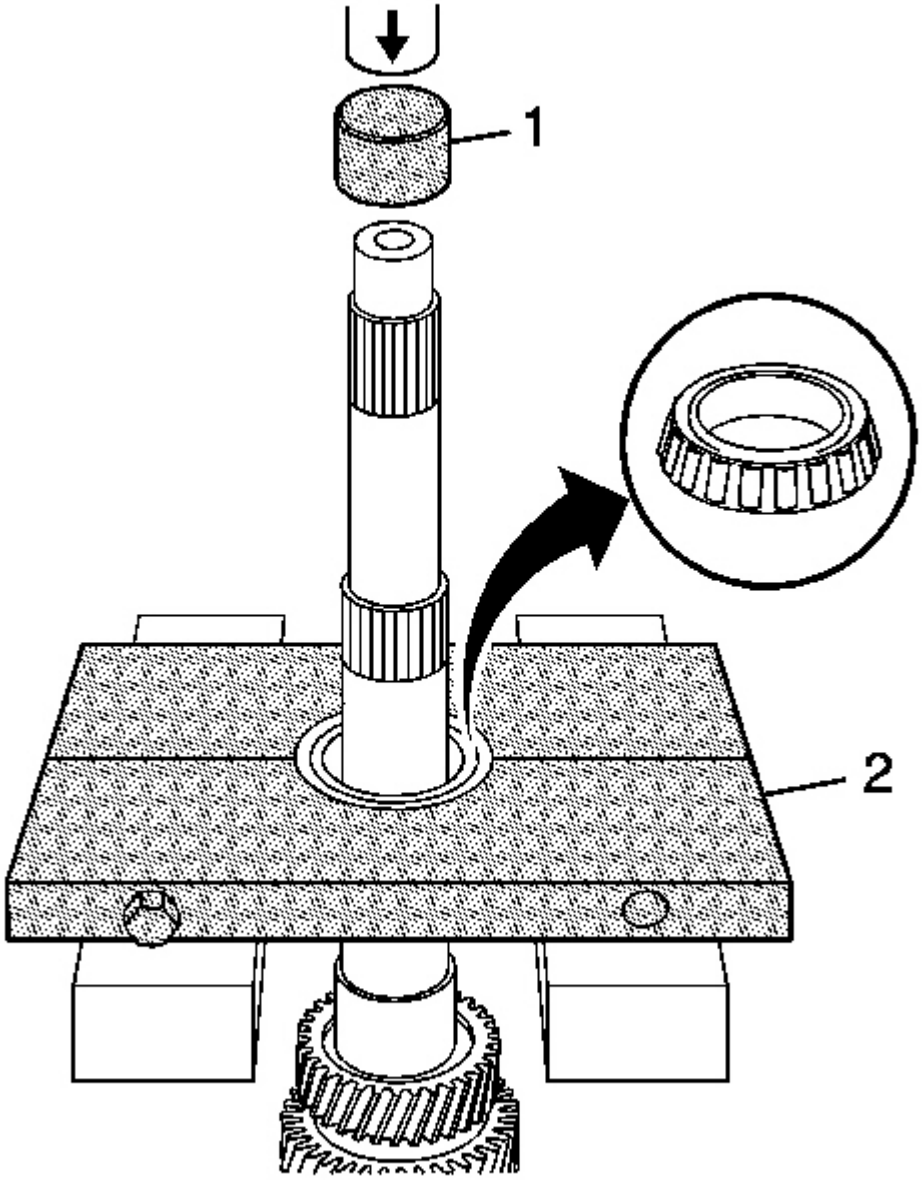


Fig. 236: View Of Tapered Bearing, J 39511 & J 39547
Courtesy of GENERAL MOTORS CORP.

3. Remove the large tapered bearing, using the **J 39511** (2), the **J 39547** (1), and a hydraulic press. See **Special Tools**.

4. Discard the large tapered bearing.

SYNCHRONIZERS DISASSEMBLE

1st/2nd, 3rd/4th, 5th/6th Synchronizers

IMPORTANT: Synchronizer components are not interchangeable. Keep all the synchronizer components separate. The synchronizer hubs and the sliding sleeves are a selected assembly. Keep the hubs and the sliding sleeves together as originally assembled.

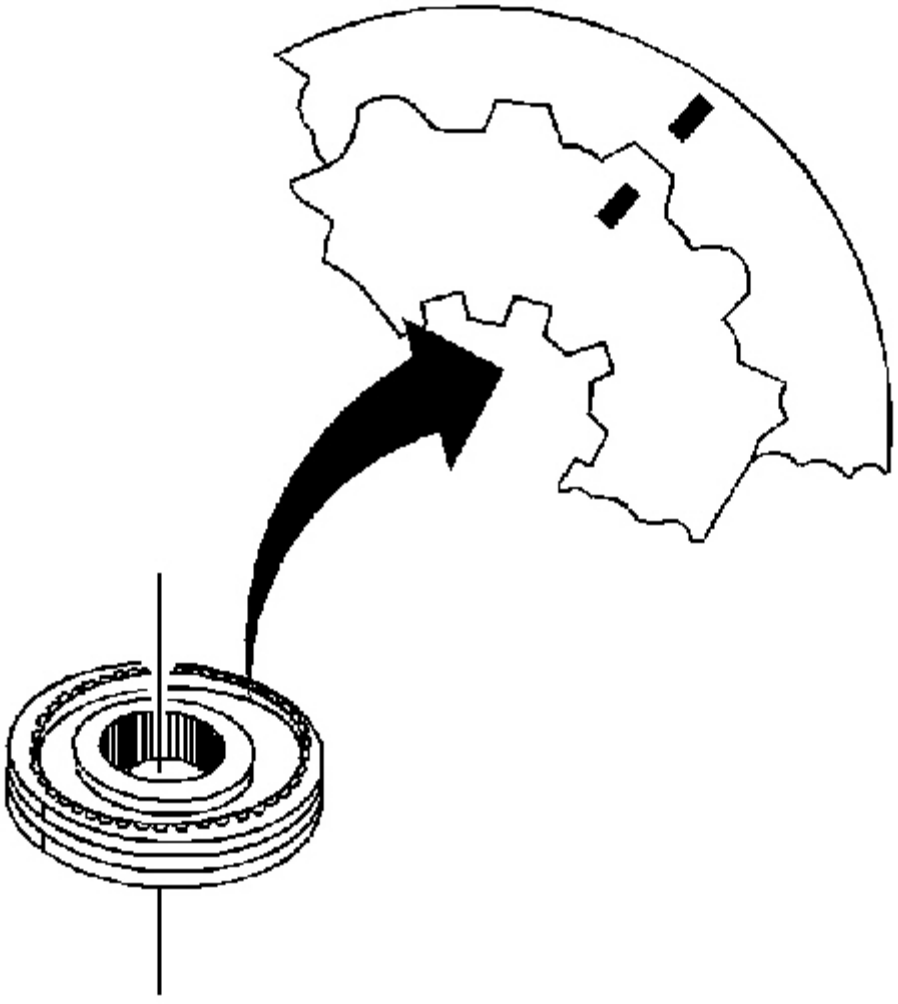


Fig. 237: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

1. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.

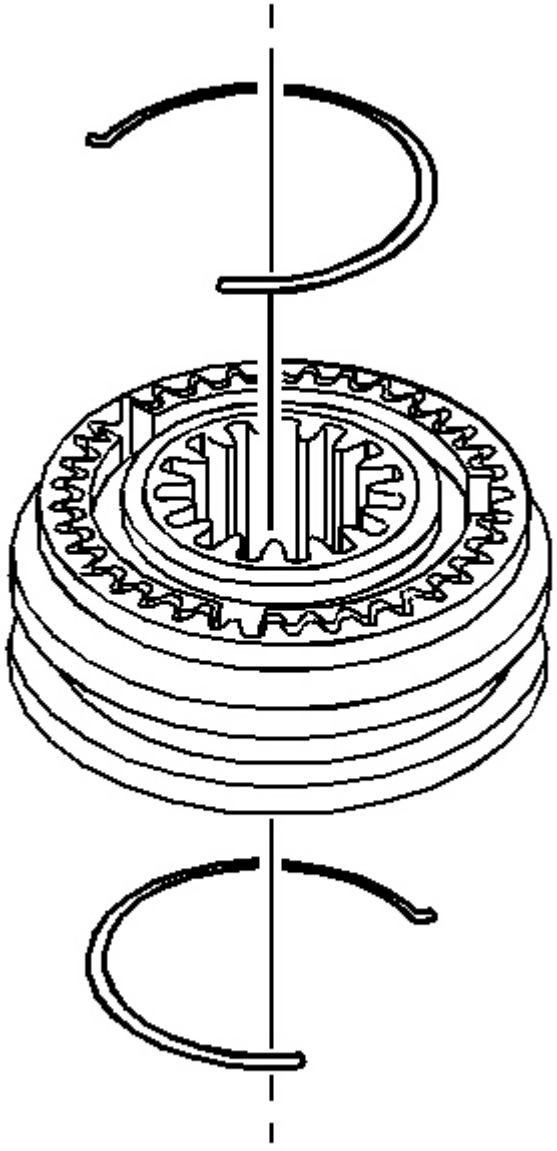


Fig. 238: View Of Synchronizer Springs
Courtesy of GENERAL MOTORS CORP.

2. Remove the synchronizer springs. Use a small-blade screwdriver.

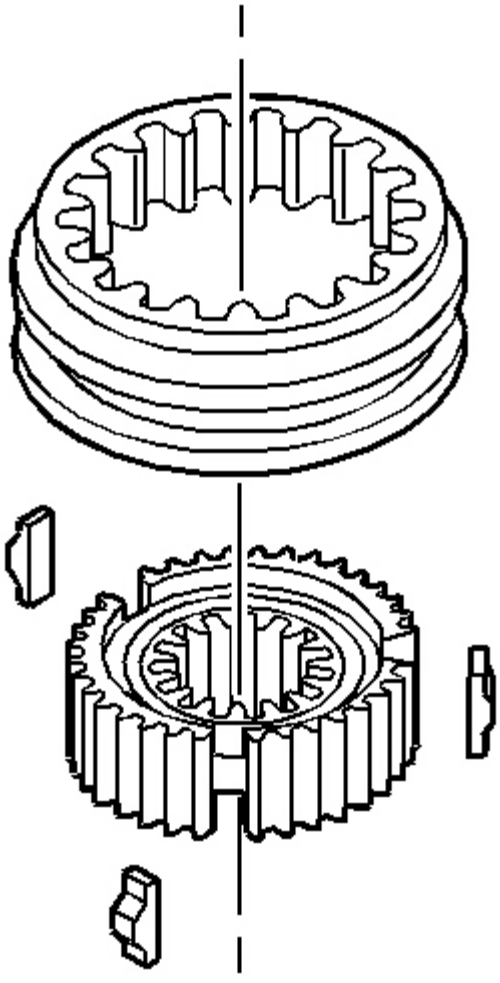


Fig. 239: View Of Synchronizer Sleeve & Keys On Hub
Courtesy of GENERAL MOTORS CORP.

3. Remove the synchronizer sleeve and the keys from the hub.

Reverse Synchronizer

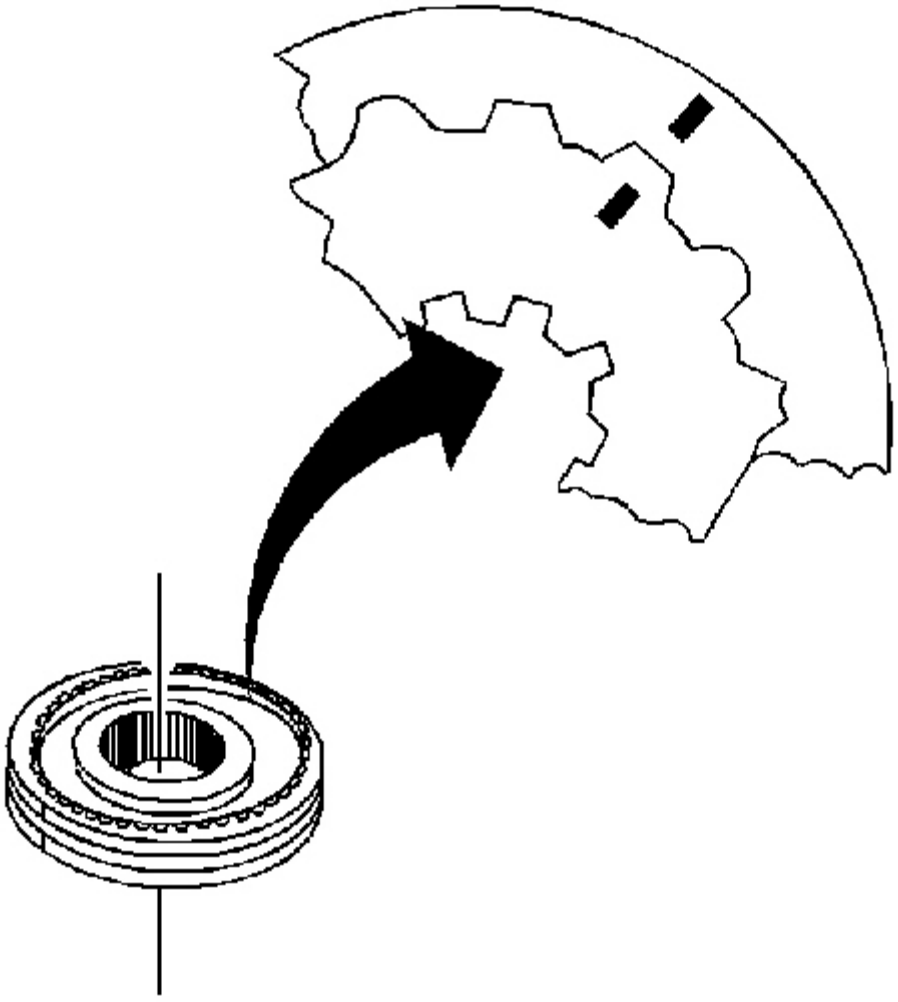


Fig. 240: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

1. Scribe a mark on the synchronizer hub and on the sleeve. This will help you to reinstall the parts in the same position.

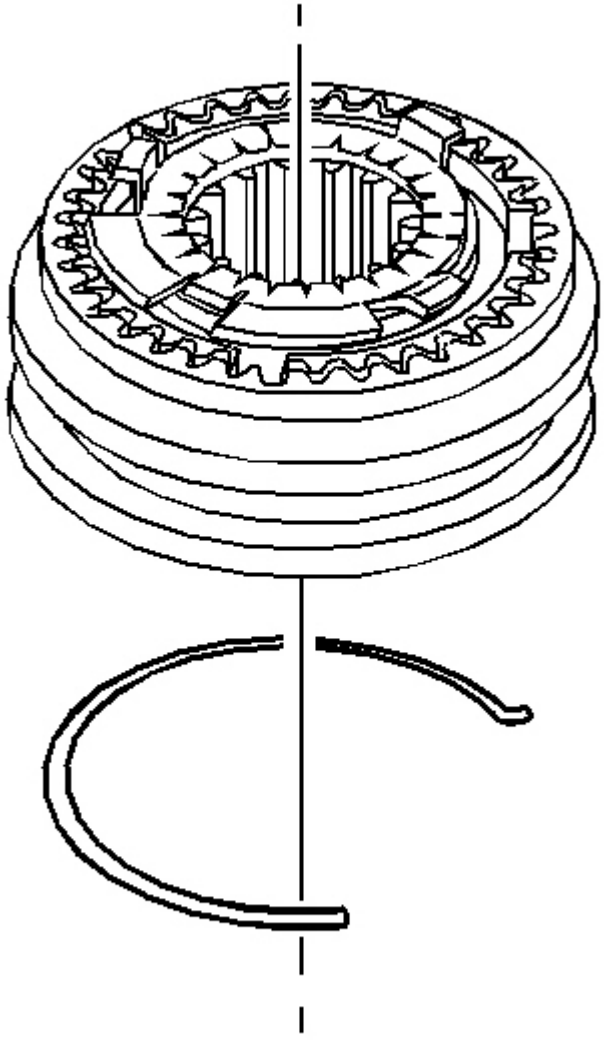


Fig. 241: Locating Synchronizer Spring
Courtesy of GENERAL MOTORS CORP.

2. Remove the synchronizer spring. Use a small-bladed screwdriver.

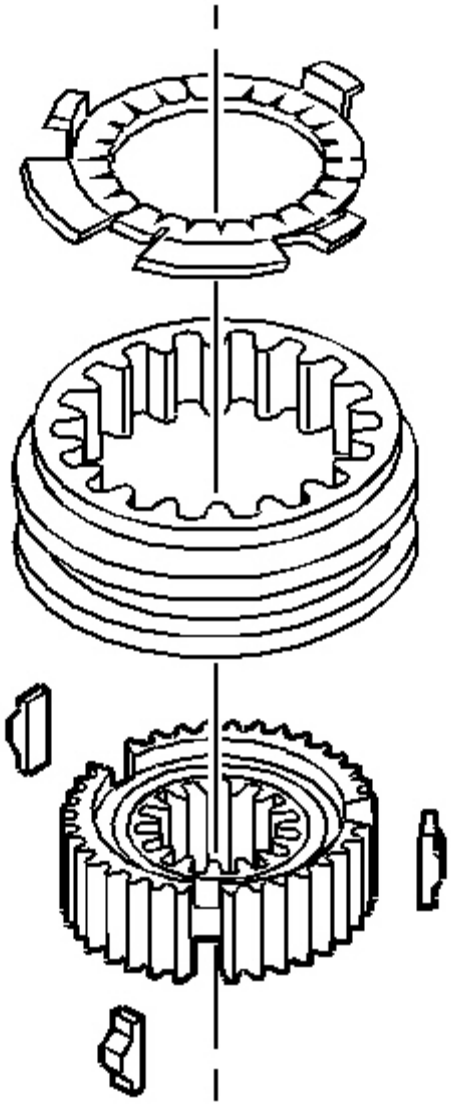


Fig. 242: View Of Synchronizer Sleeve & Keys On Hub
Courtesy of GENERAL MOTORS CORP.

3. Remove the synchronizer sleeve from the hub. Press against the inner hub.
4. Turn the hub over. The keys will slide out from the hub.

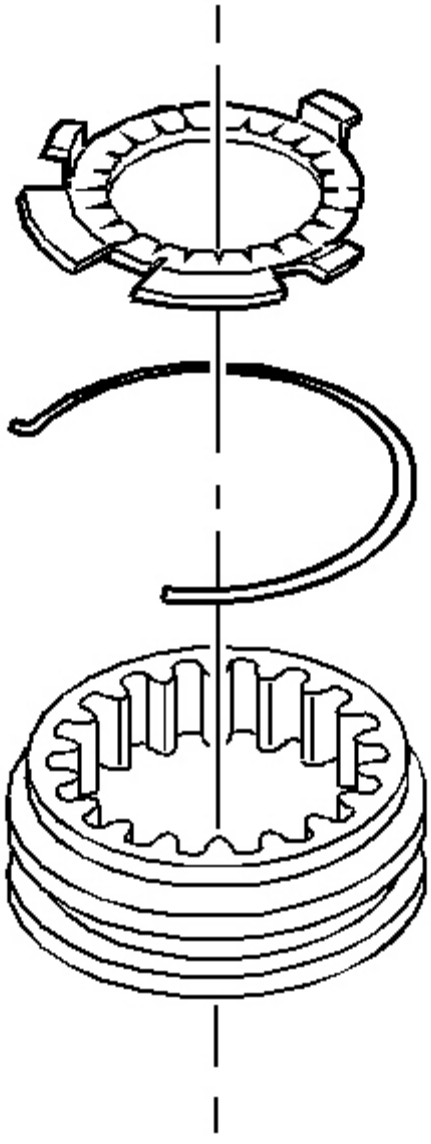


Fig. 243: Identifying Synchronizer Key Retainer & Spring
Courtesy of GENERAL MOTORS CORP.

5. Remove the following parts using a small-blade screwdriver:
    1. The synchronizer key retainer
    2. The synchronizer spring

6. Discard the synchronizer key retainer.

SYNCHRONIZERS CLEANING AND INSPECTION

1. Clean all the synchronizer parts in a suitable solvent. Air dry all the synchronizer parts.
2. Inspect the synchronizer parts for the following conditions:
   - Burrs
   - Cracks
   - Chamfer for excessive wear
   - Free movement of the clutching sleeves on their hubs
   - Worn or damaged clutch teeth
   - Distorted springs
3. Replace synchronizer parts that are worn or damaged.

   Replace a burred or nicked part that cannot be reconditioned by hand. Use a soft stone or a crocus cloth.

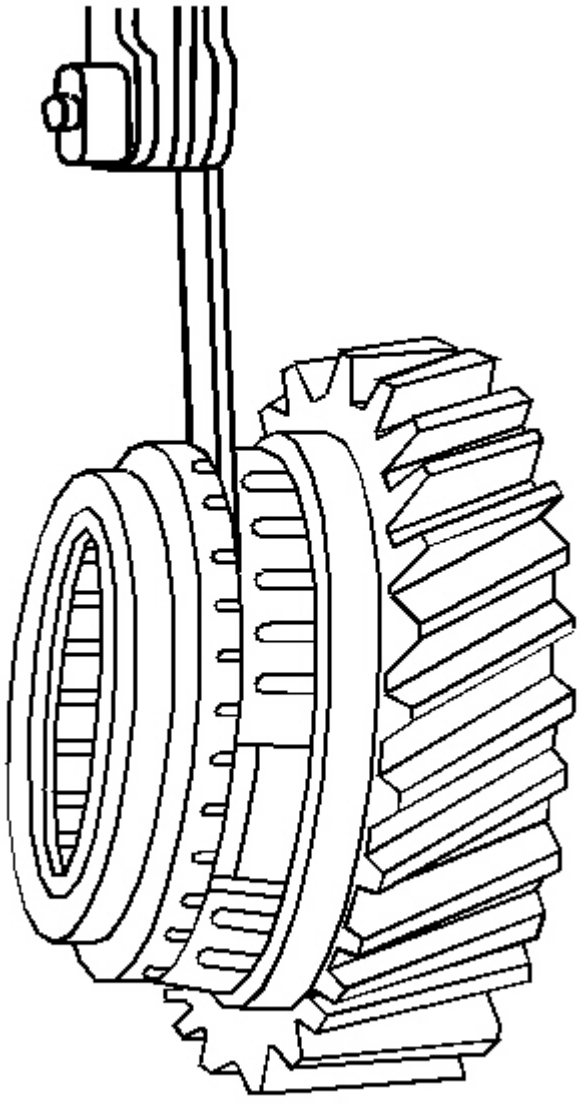


Fig. 244: Measuring Gap Between Blocking Ring & Speed Gear
Courtesy of GENERAL MOTORS CORP.

4. Measure the gap between the vertical faces of the blocking ring teeth and the speed gear as follows:
    1. Assemble the correct blocking ring with the correct speed gear.
    2. The blocking ring must be fully seated on the gear.

3. Use a feeler gauge to measure the forward gear gap.
4. Use a feeler gauge to measure the reverse gear gap.

   Measure the gap without the wave washer in between the blocking ring and the reverse gear.

   The nominal gap is 1.27-2.16 mm (0.050-0.085 in) for the 1st and 2nd gear.

   The nominal gap is 1.27-2.03 mm (0.050-0.080 in) for the 3rd, 4th, 5th and 6th gear.

   Replace the friction cones and blocker rings when the gap is significantly less than specified.

SYNCHRONIZERS ASSEMBLE

1st/2nd Synchronizer

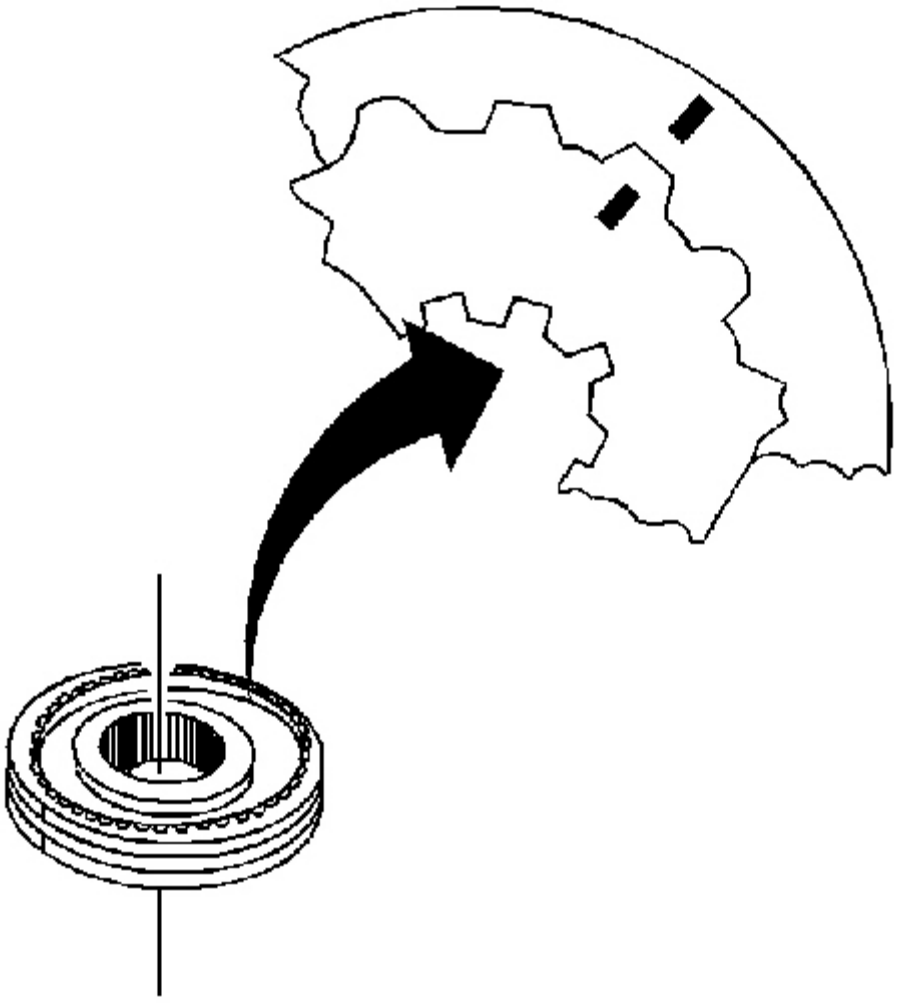


Fig. 245: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

1. Check the synchronizer assembly scribe marks for correct positions.

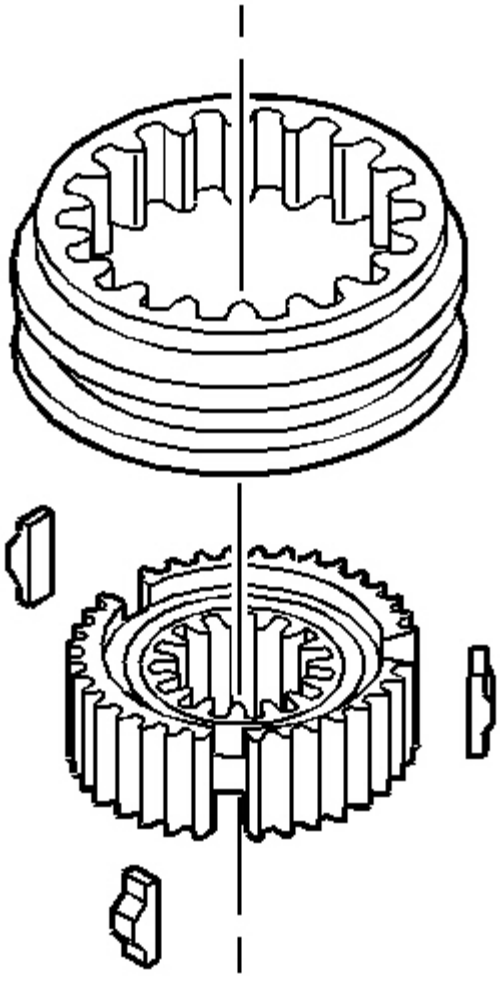


Fig. 246: View Of Synchronizer Sleeve & Keys On Hub
Courtesy of GENERAL MOTORS CORP.

2. Install the synchronizer sleeve to the hub (align the key openings in the hub with the cuts in the synchronizer sleeve).
3. Install the keys with the slots facing the hub.

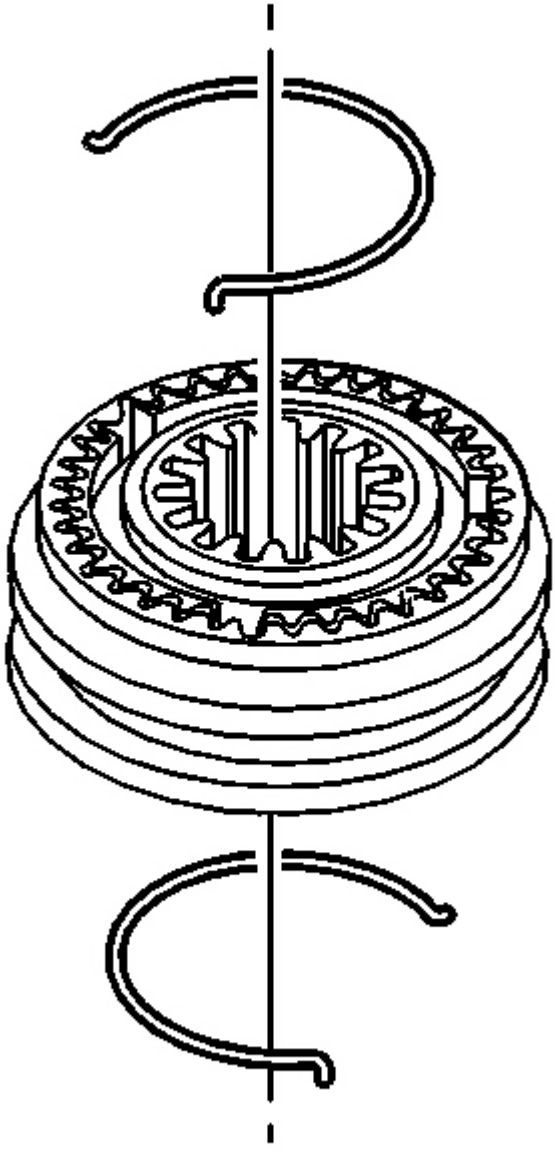


Fig. 247: View Of Reverse Synchronizer Springs
Courtesy of GENERAL MOTORS CORP.

4. Assemble the first spring (assemble the spring tangs to the side of two keys).
5. Assemble the second spring (assemble the spring tangs to the side of two keys such that the gap is not between the same two keys as the first spring).

3rd/4th, 5th/6th Synchronizers

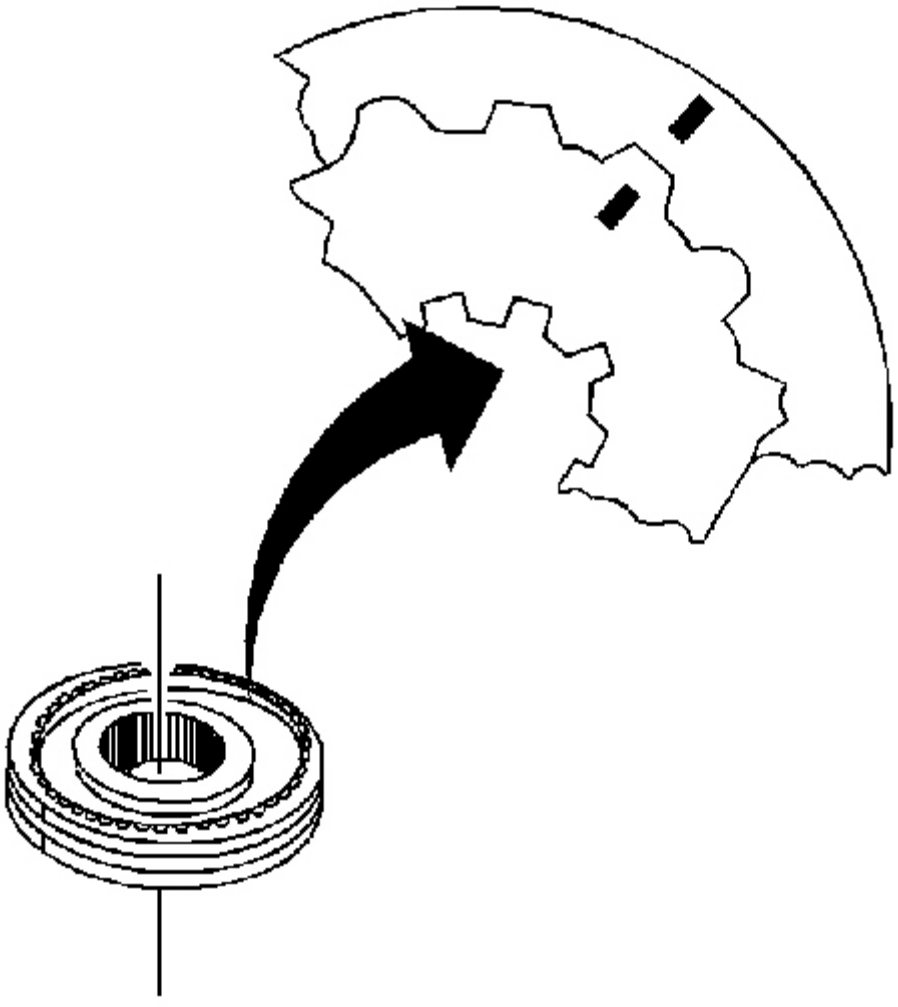


Fig. 248: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

1. Check the synchronizer assembly scribe marks for correct positions.

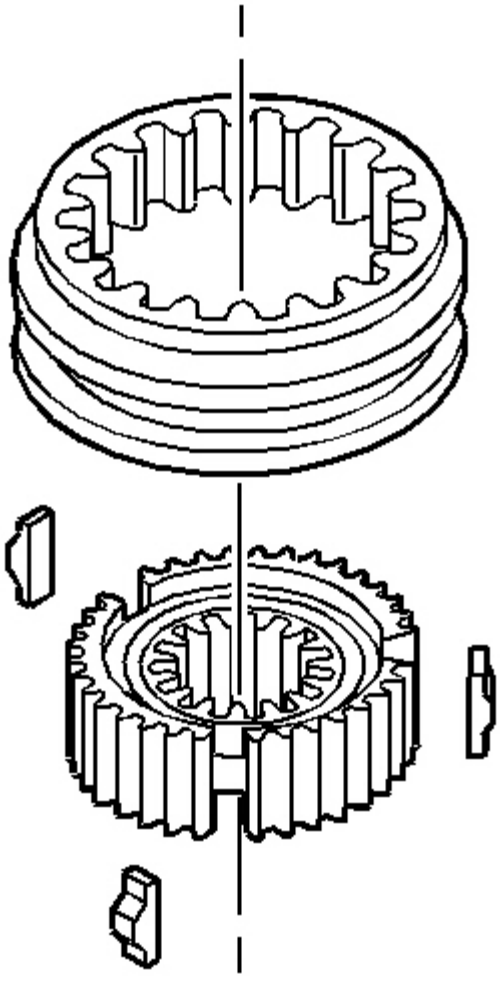


Fig. 249: View Of Synchronizer Sleeve & Keys On Hub
Courtesy of GENERAL MOTORS CORP.

2. Install the synchronizer sleeve to the hub (align the key openings in the hub with the cuts in the synchronizer sleeve).
3. Install the keys with the slots facing the hub.

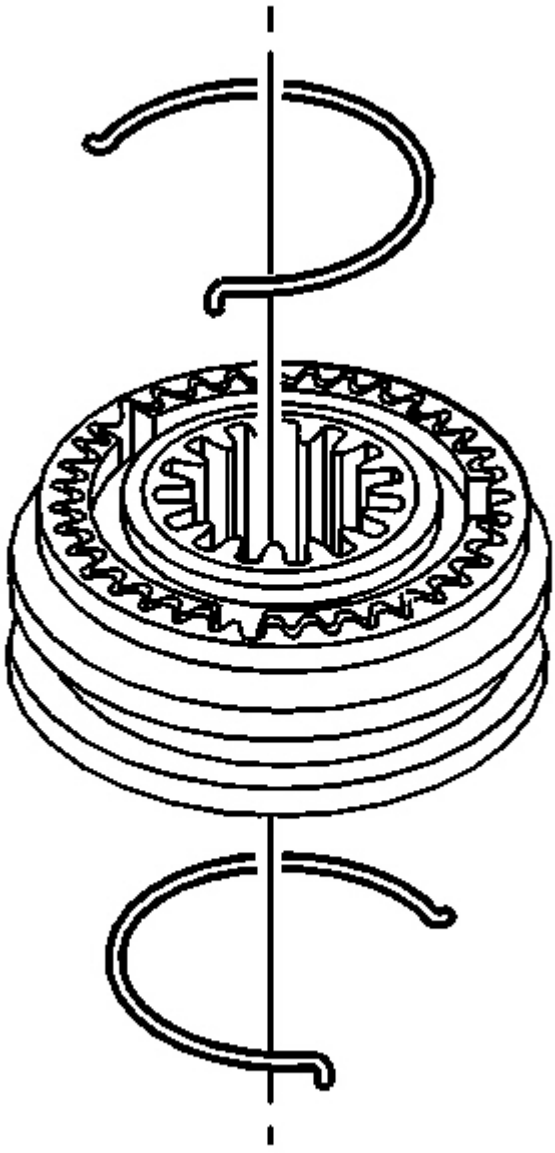


Fig. 250: View Of Reverse Synchronizer Springs
Courtesy of GENERAL MOTORS CORP.

4. Assemble the first spring (assemble the spring tang to one of the key slots).
5. Assemble the second spring (assemble the spring tang on the same key but in the opposite direction).

Reverse Synchronizer

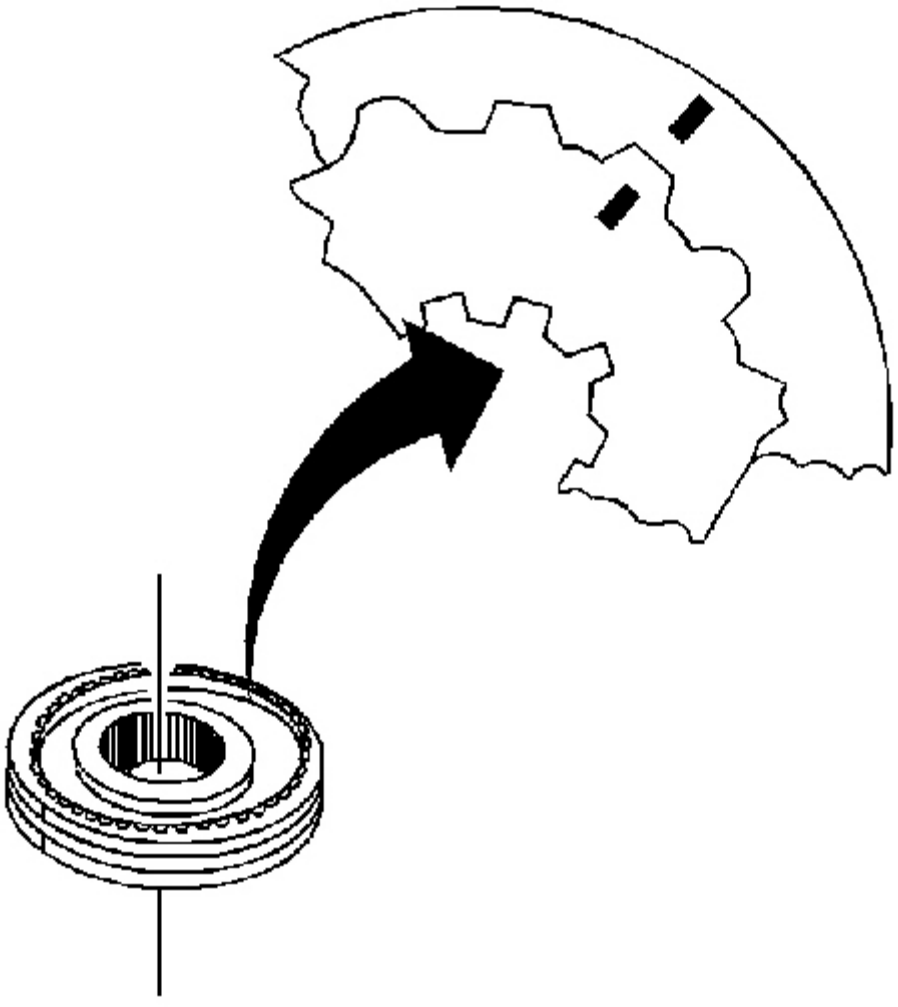


Fig. 251: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

1. Check the synchronizer assembly scribe marks for correct positions.

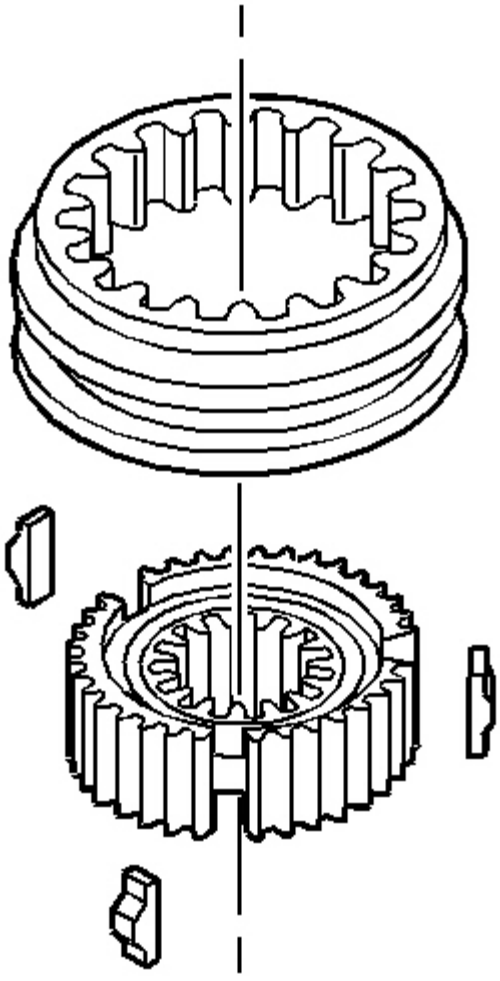


Fig. 252: View Of Synchronizer Sleeve & Keys On Hub
Courtesy of GENERAL MOTORS CORP.

2. Install the synchronizer sleeve to the hub (align the key openings in the hub with the cuts in the synchronizer sleeve).
3. Install the keys with the slots facing the hub.

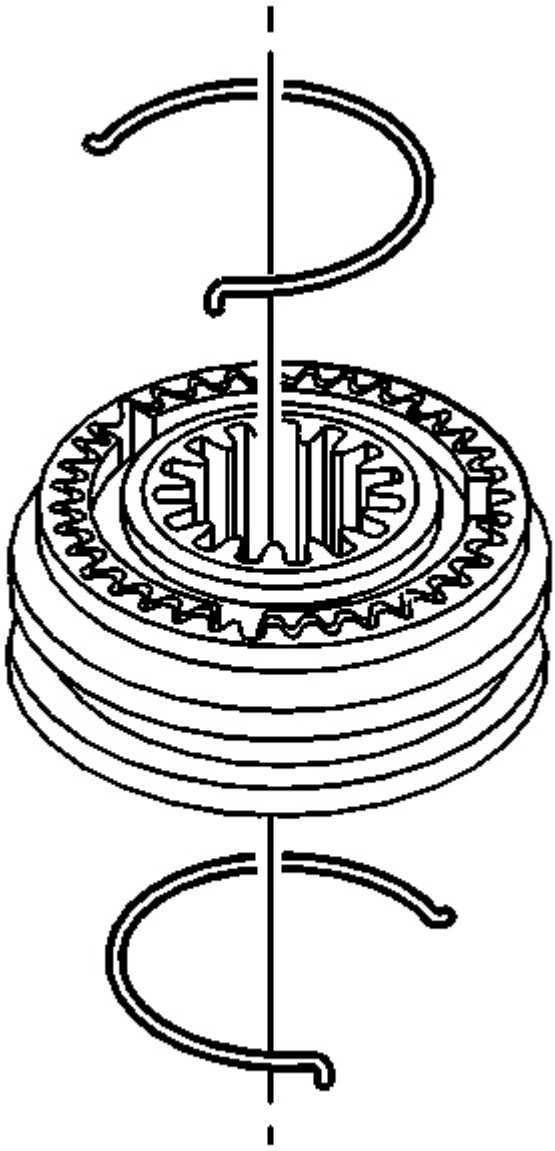


Fig. 253: View Of Reverse Synchronizer Springs
Courtesy of GENERAL MOTORS CORP.

4. Assemble the first spring (assemble the spring tang to one of the key slots).
5. Assemble the second spring (assemble the spring tang on the same key but in the opposite direction).

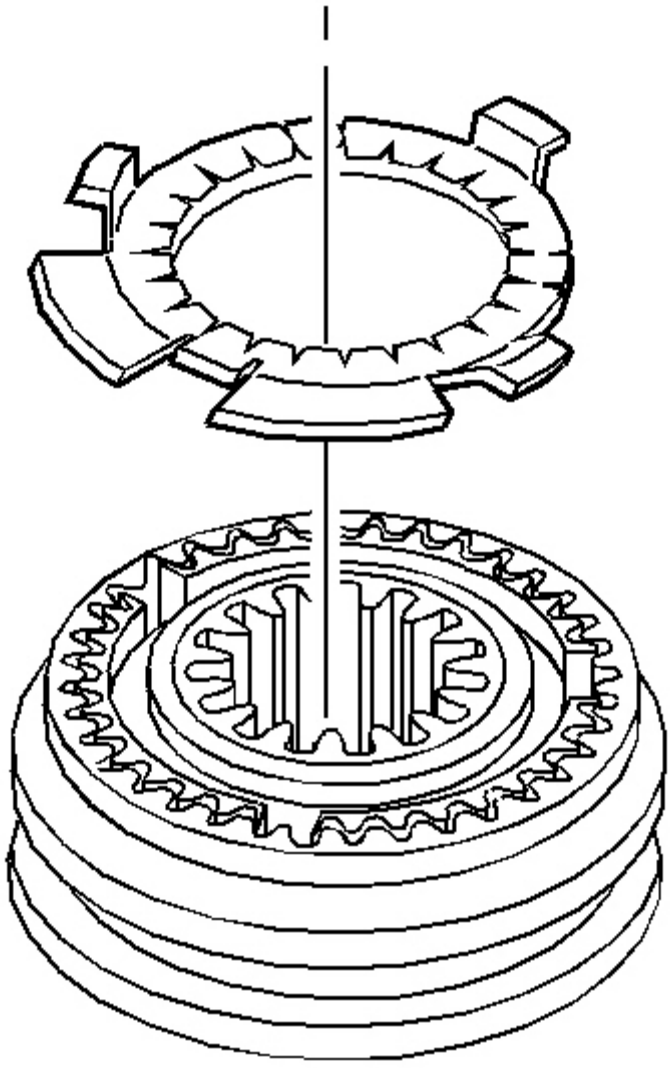


Fig. 254: Aligning Synchronizer Key Retainer Tangs Over Synchronizer Keys
Courtesy of GENERAL MOTORS CORP.

6. Install a new synchronizer key retainer with the key retainer tangs over the synchronizer keys.

SHIFT RAIL AND FORK ASSEMBLIES DISASSEMBLE

1st/2nd, 3rd/4th Shift Rail Assembly

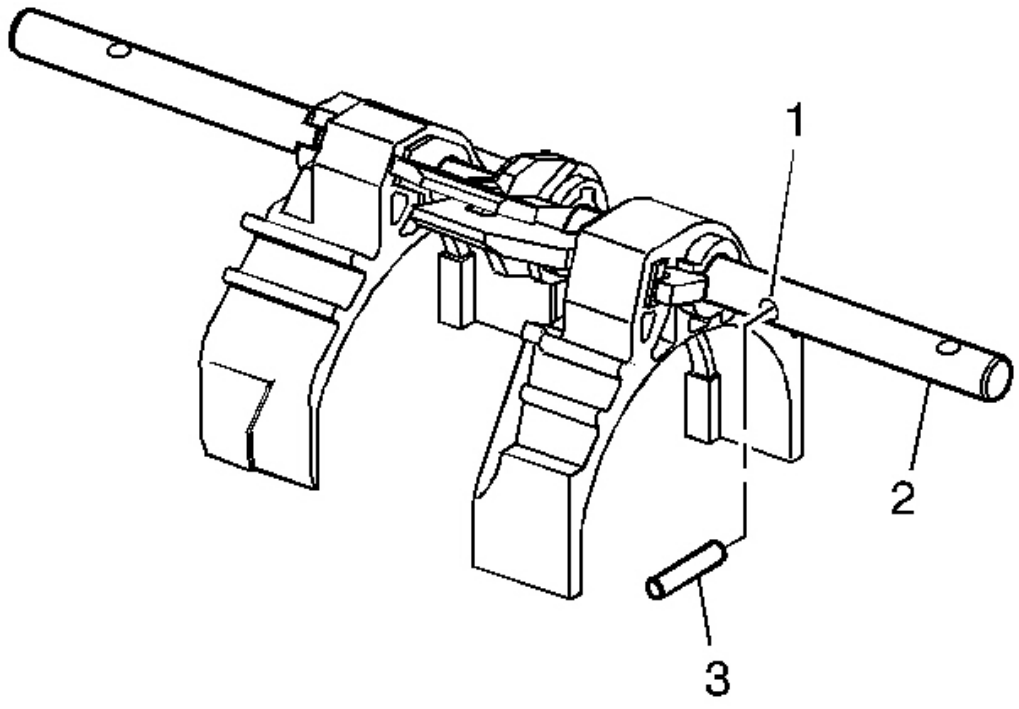


Fig. 255: View Of Neutral Return Cam Pin In Shift Shaft
Courtesy of GENERAL MOTORS CORP.

1. Remove the neutral return cam pin (3) from the shift shaft (2).

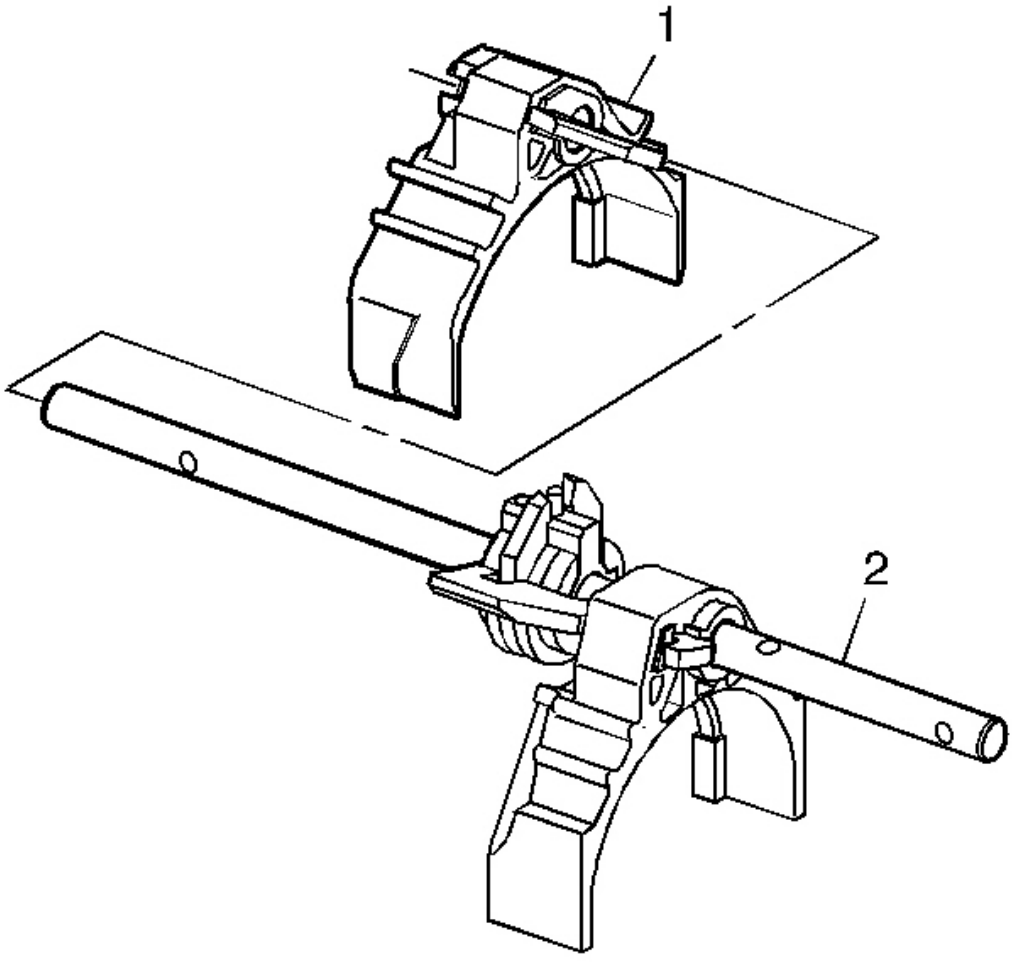


Fig. 256: View Of 1st/2nd Shift Fork On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

2. Remove the 1st/2nd shift fork (1) from the shift shaft (2).

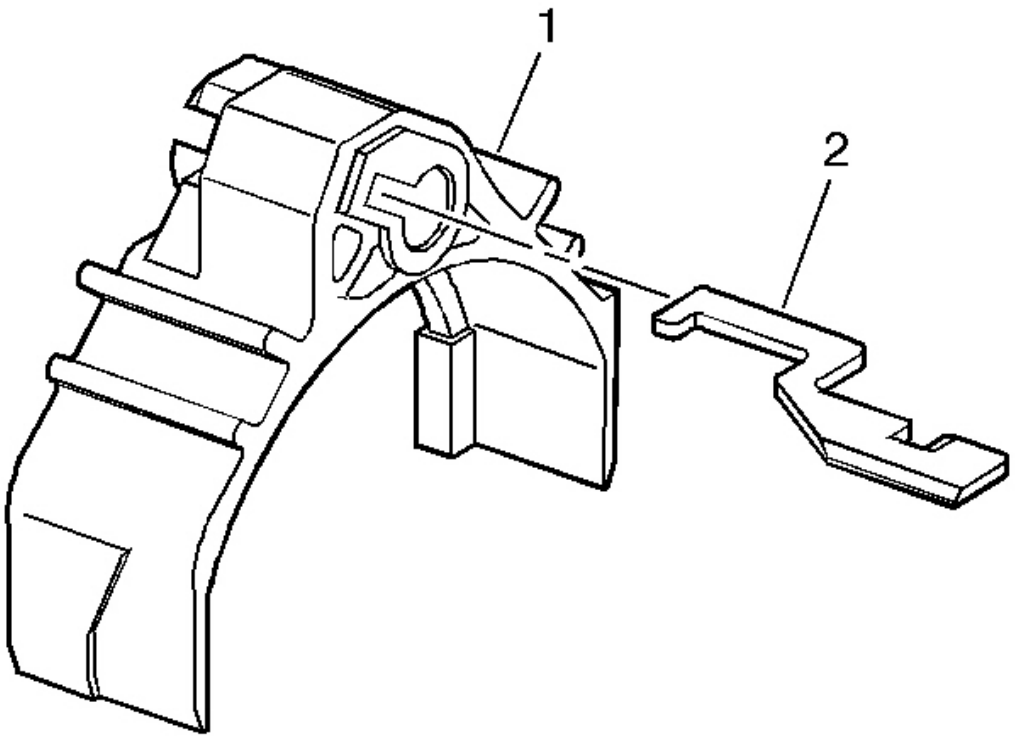


Fig. 257: Locating Shift Link & 1st/2nd Shift Fork
Courtesy of GENERAL MOTORS CORP.

3. Remove the shift link (2) from the 1st/2nd shift fork (1).

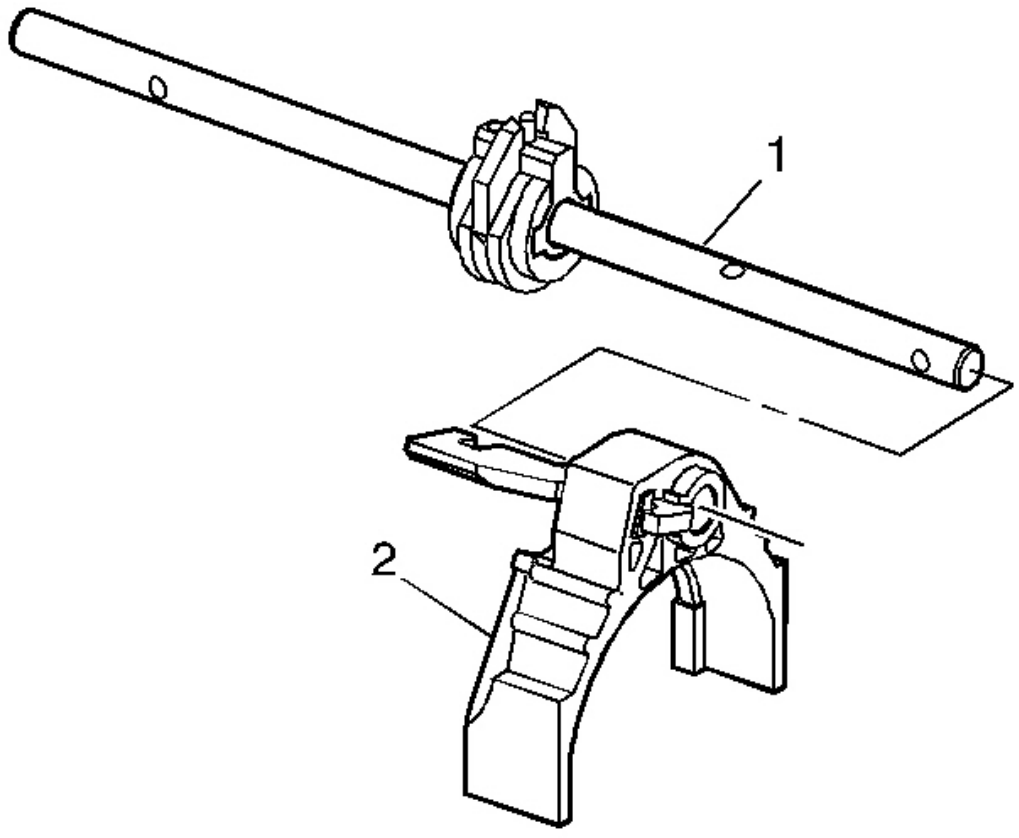


Fig. 258: Identifying 3rd/4th Shift Fork & Shift Shaft
Courtesy of GENERAL MOTORS CORP.

4. Remove the 3rd/4th shift fork (2) from the shift shaft (1).

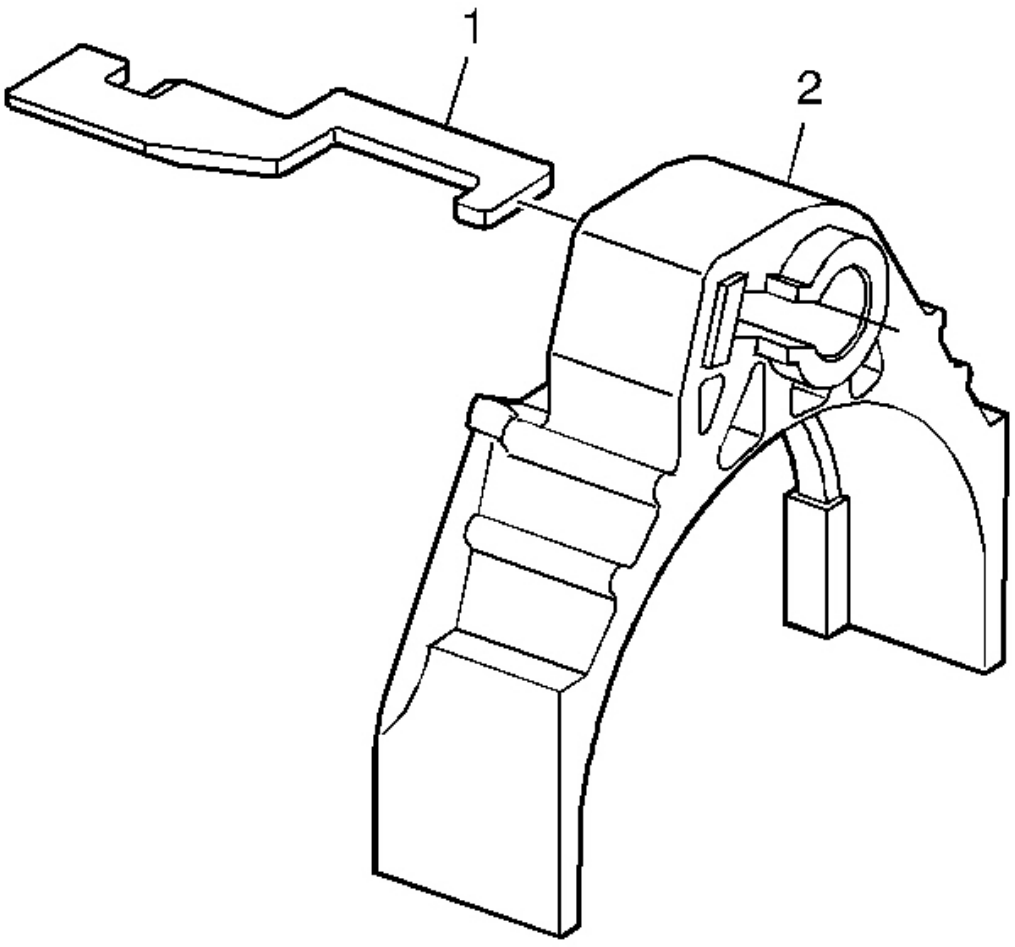


Fig. 259: View Of Shift Link In 3rd/4th Shift Fork
Courtesy of GENERAL MOTORS CORP.

5. Remove the shift link (1) from the 3rd/4th shift fork (2).

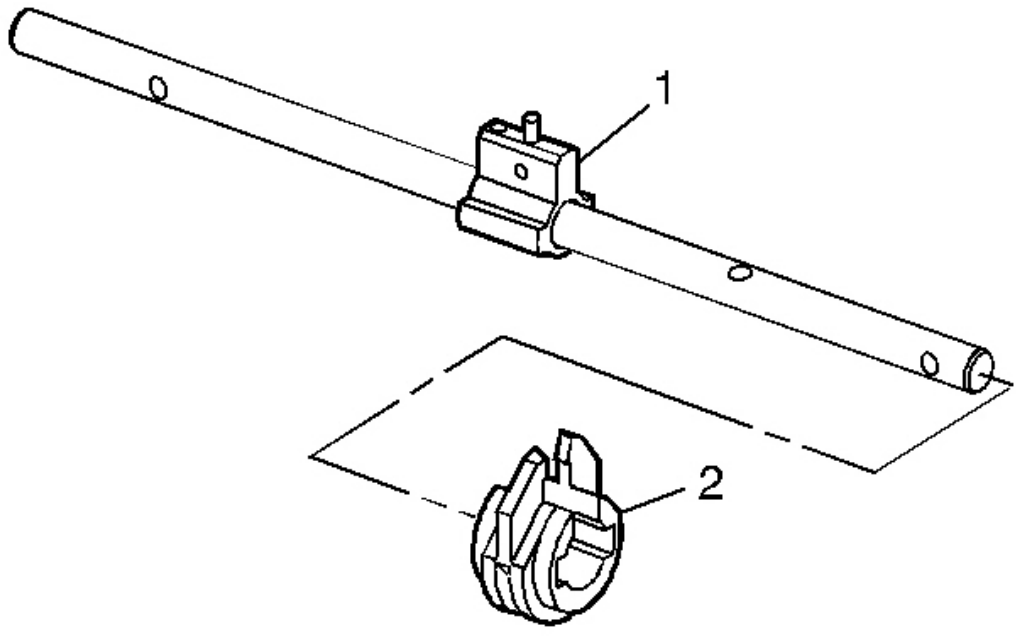


Fig. 260: Locating Interlocking Plate On Selector Pin
Courtesy of GENERAL MOTORS CORP.

6. Remove the interlocking plate (2) from the selector pin (1).

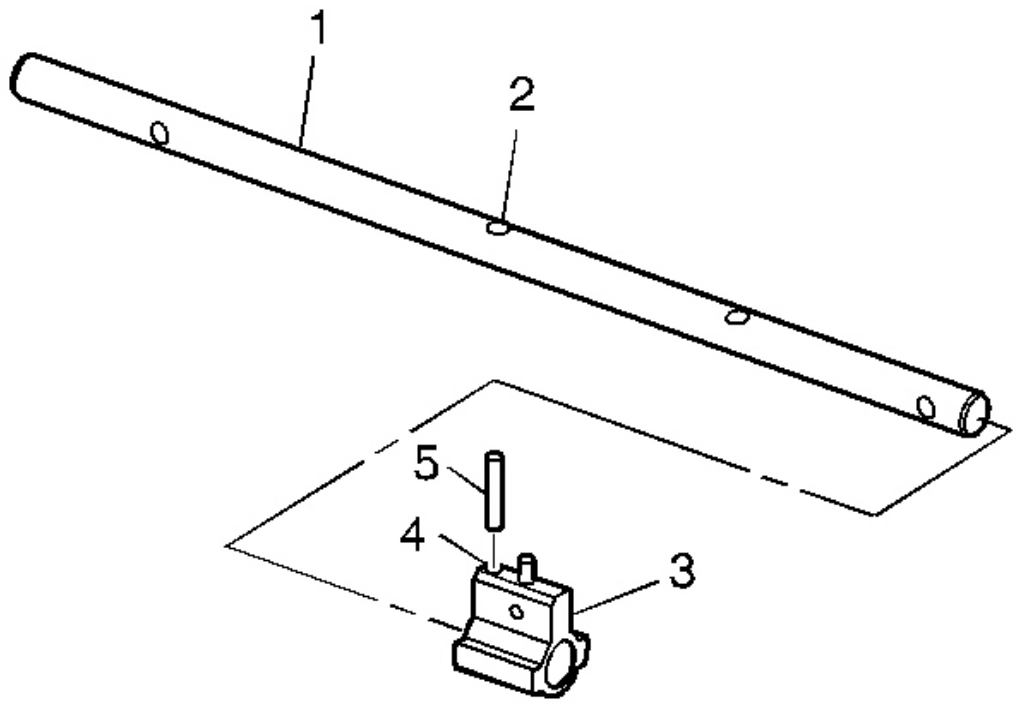


Fig. 261: View Of Selector Pin & Roll Pin On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

7. Remove the selector roll pin (5).
8. Remove the selector pin (3) from the shift shaft (1).

5th/6th, Reverse Shift Rail Assembly

Tools Required

- **J 23907** Slide Hammer
- **J 39439-2** Bushing Remover. See **Special Tools**.

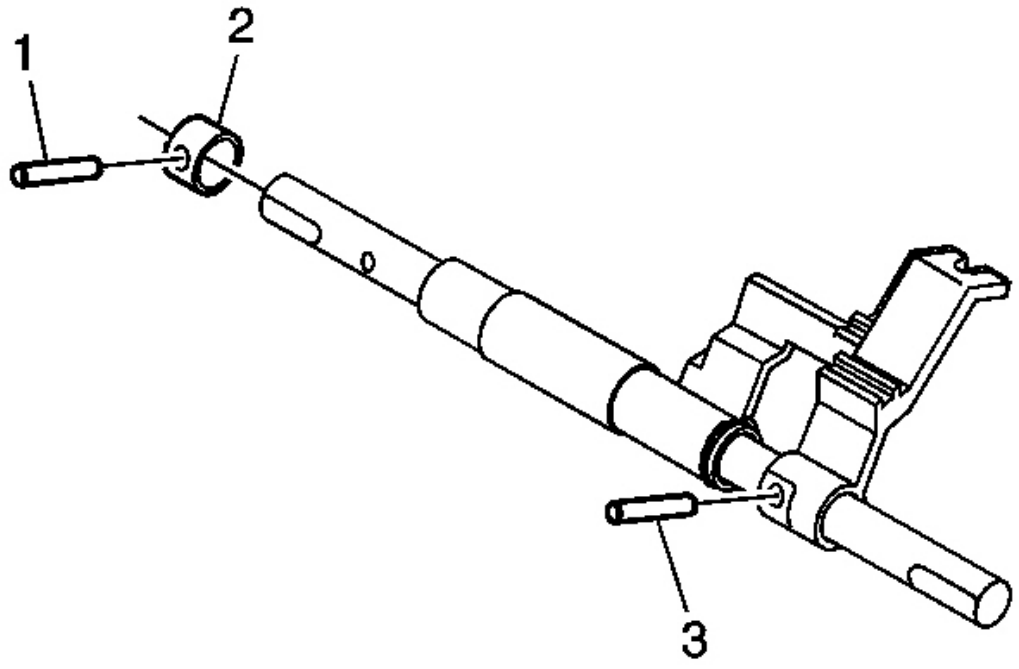


Fig. 262: View Of Reverse Lever Roll Pin, Reverse Collar & Reverse Collar Roll Pin
Courtesy of GENERAL MOTORS CORP.

1. Remove the reverse collar roll pin (1).
2. Remove the reverse collar (2).
3. Remove the reverse shift lever roll pin (3).

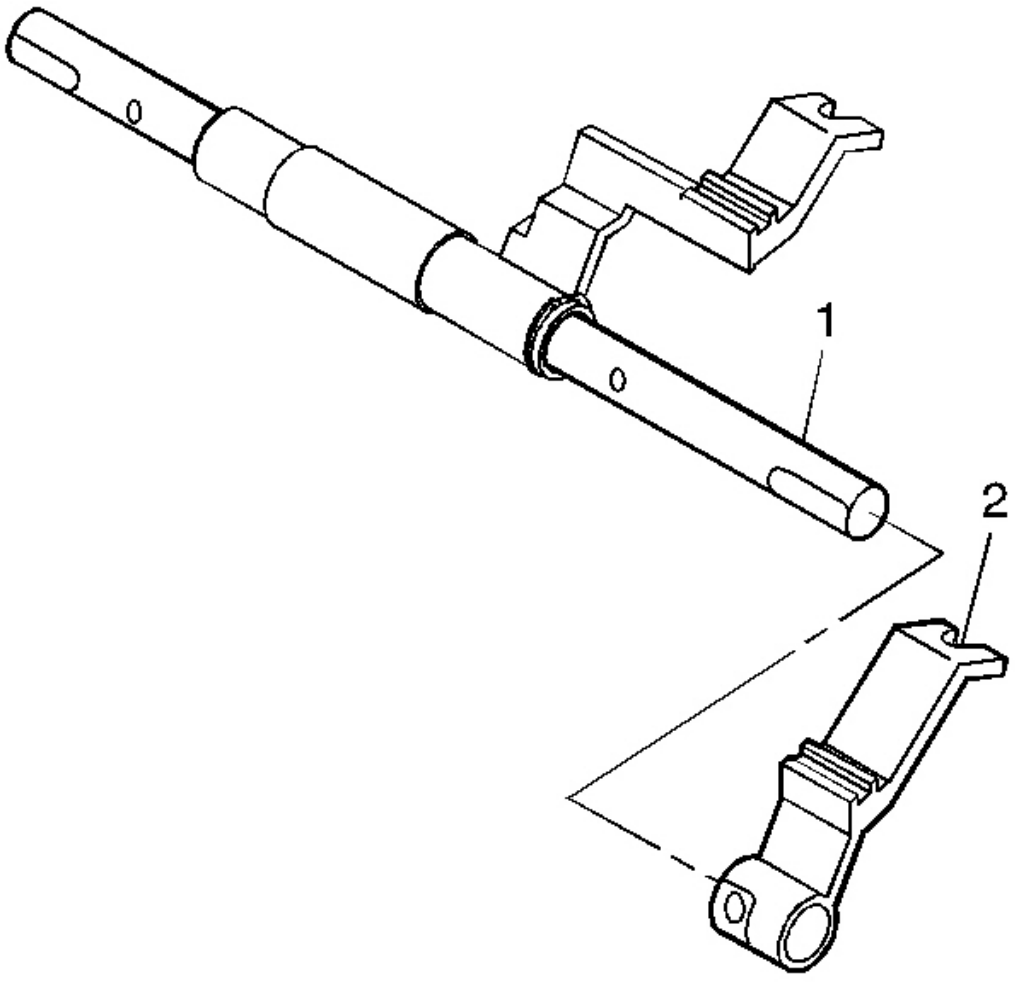


Fig. 263: View Of Reverse Shift Lever Onto Shift Shaft
Courtesy of GENERAL MOTORS CORP.

4. Remove the reverse shift lever (2) from the shift shaft (1).

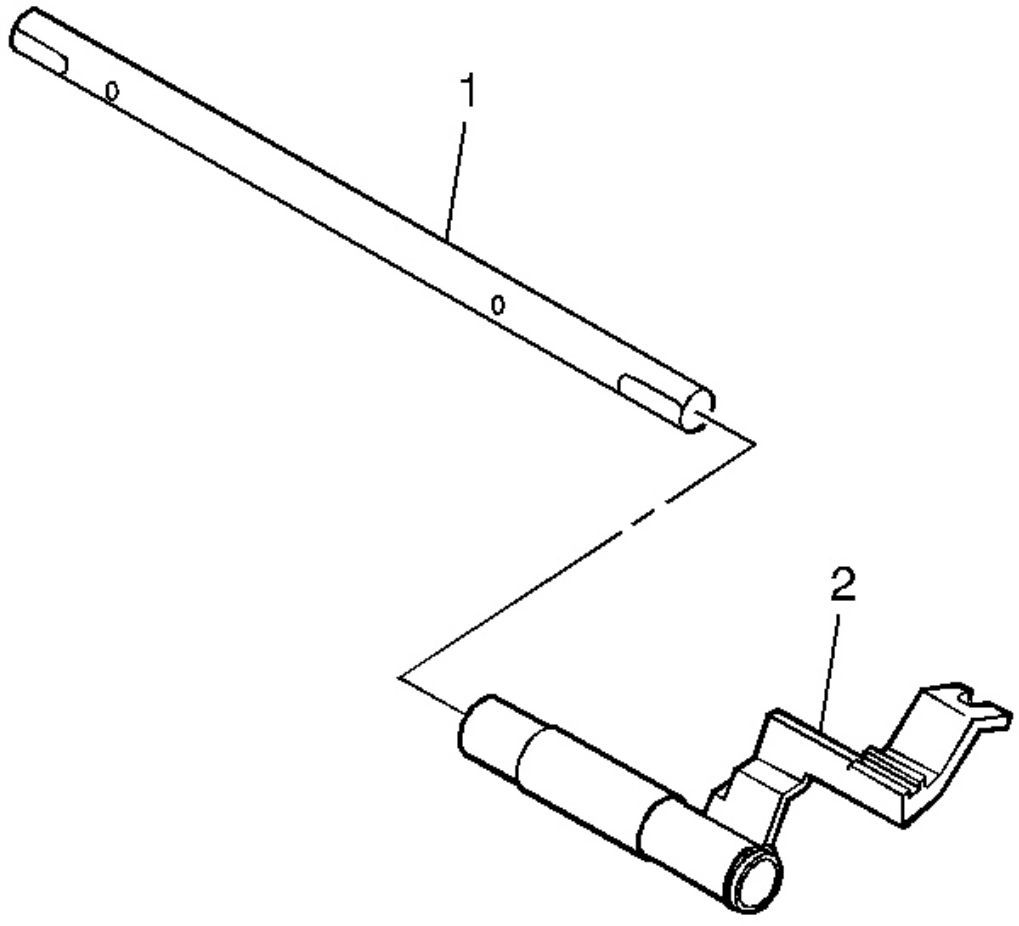


Fig. 264: Identifying 5th/6th Shift Lever
Courtesy of GENERAL MOTORS CORP.

5. Remove the 5th/6th shift lever (2) from the shift rail (1).

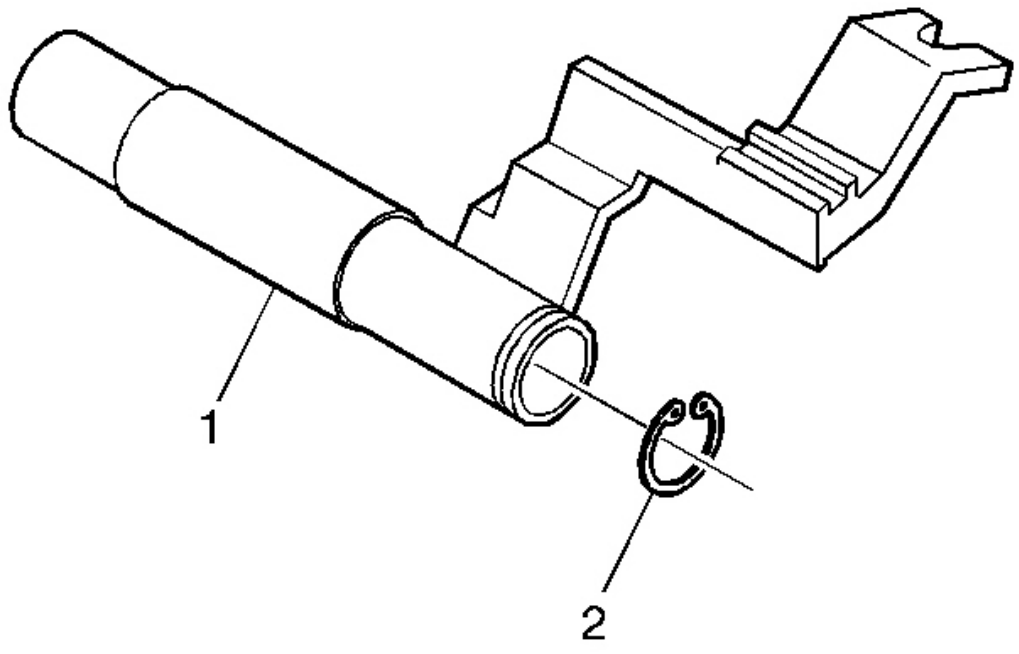


Fig. 265: Locating Retainer Ring On 5th/6th Shift Lever
Courtesy of GENERAL MOTORS CORP.

6. Remove the snap ring (1) from the 5th/6th shift lever (2).

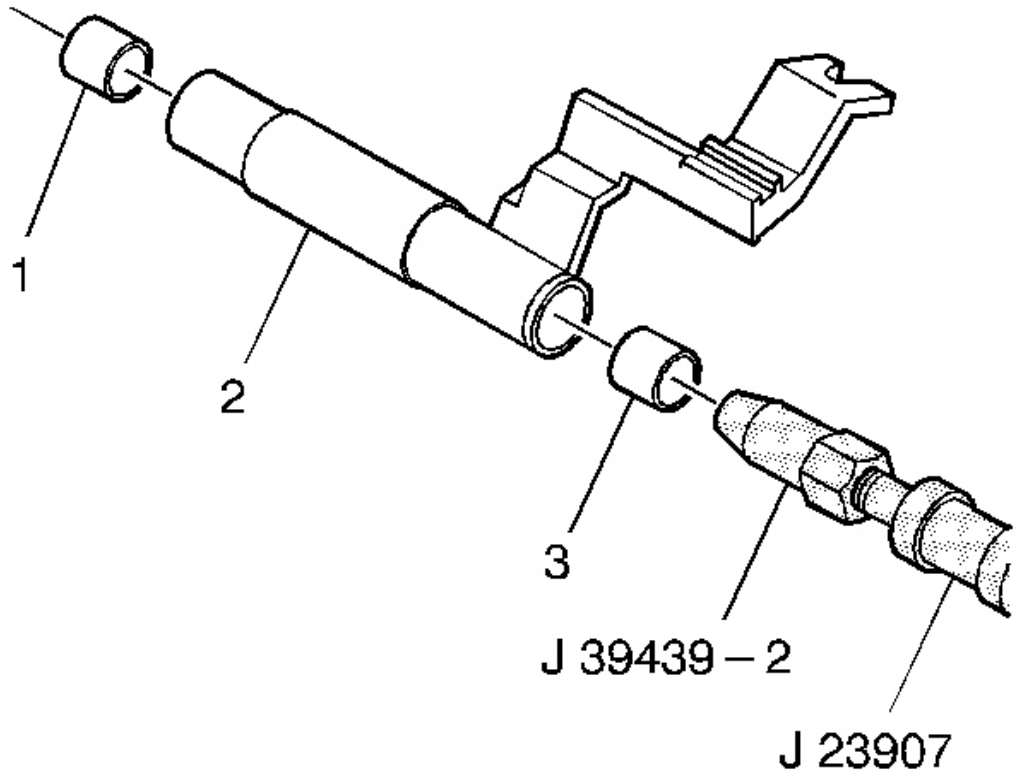


Fig. 266: View Of 5Th/6Th Shift Shaft Lever Bushings, 5Th/6Th Shift Lever, J 23907 & J 39439-2
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not replace the bushings unless inspection shows bushing damage.

7. Remove the 5th/6th shift shaft lever bushings (1) and (3) from the 5th/6th shift lever (2) using the **J 23907** and the **J 39439-2** . See **Special Tools**.

SHIFT RAIL AND FORK ASSEMBLIES CLEANING AND INSPECTION

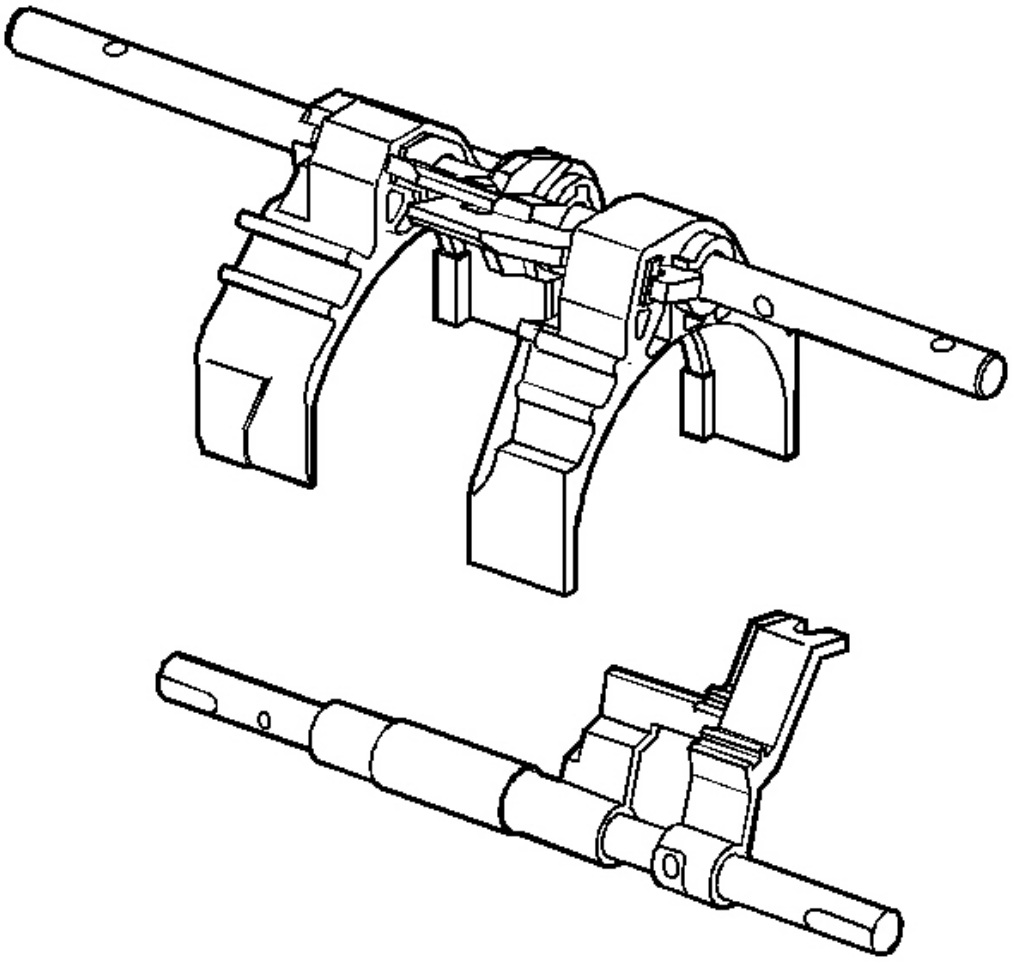


Fig. 267: Fork Assembly & Shift Shaft
Courtesy of GENERAL MOTORS CORP.

1. Clean the shift shaft and fork assembly parts with a suitable solvent. Air dry all the parts.

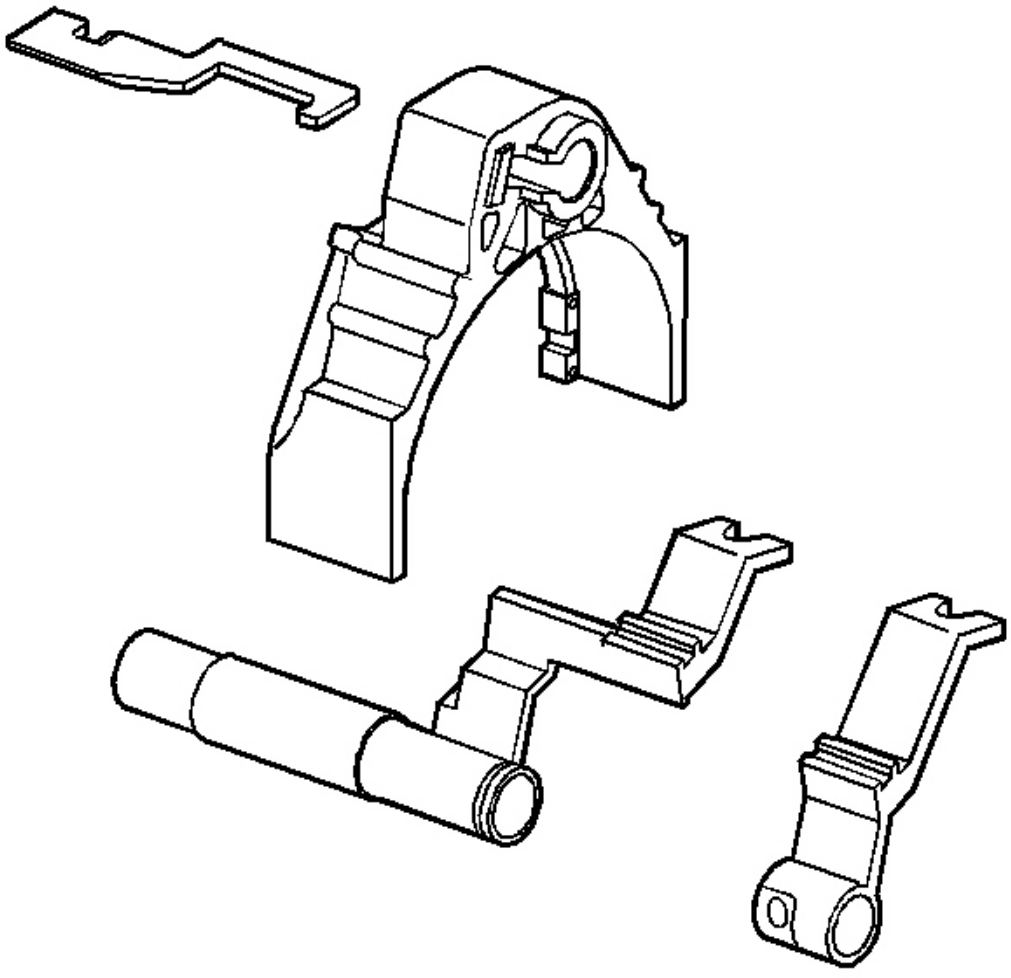


Fig. 268: Shift Links & Shift Forks
Courtesy of GENERAL MOTORS CORP.

2. Inspect the shift forks and the shift links for excessive wear, fractures or distortion.

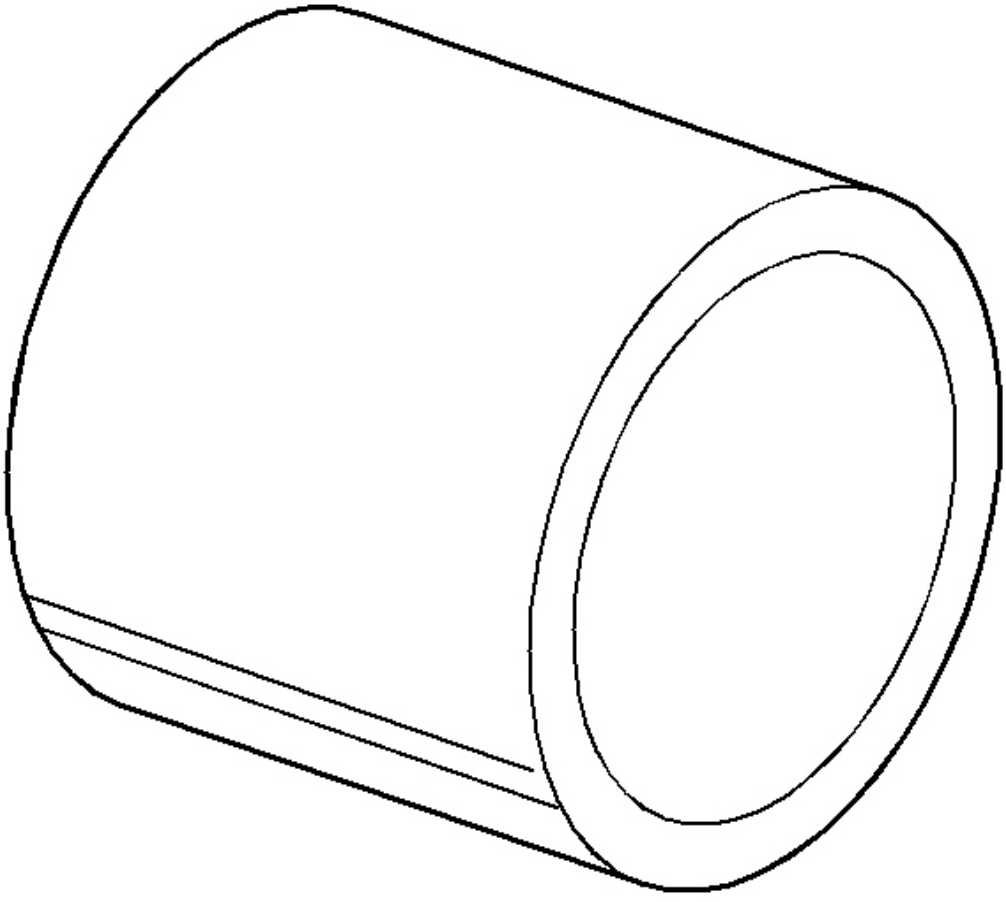


Fig. 269: View Of Shift Shaft Lever Bushing
Courtesy of GENERAL MOTORS CORP.

3. Inspect the shift shaft lever bushings for excessive wear.

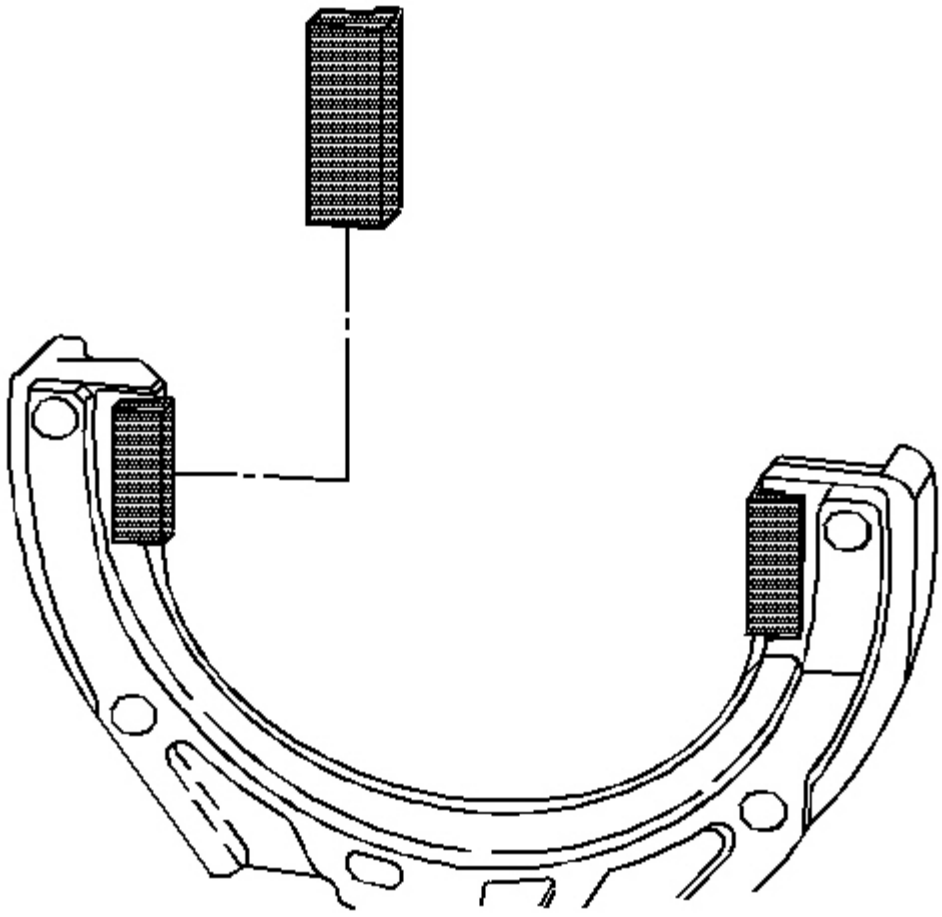


Fig. 270: Identifying Inspection Areas On Shift Fork Nylon Inserts
Courtesy of GENERAL MOTORS CORP.

4. Inspect the shift fork nylon inserts for wear.
5. Replace parts that are fractured, excessively worn, or distorted.
6. Replace an excessively worn or burred shift shaft.

SHIFT RAIL AND FORK ASSEMBLIES ASSEMBLE

1st/2nd, 3rd/4th Shift Rail Assembly

Tools Required

J 36850 Transjel Lubricant. See **Special Tools**.

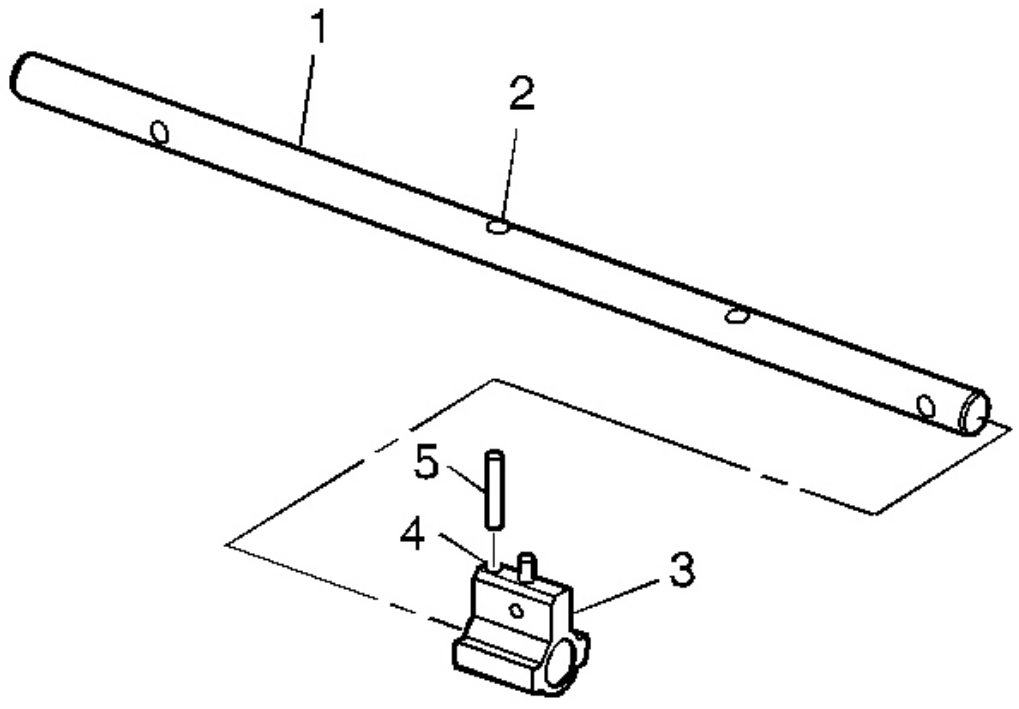


Fig. 271: View Of Selector Pin & Roll Pin On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the selector pin (3) on the shift shaft (4).
2. Align the roll pin hole on the selector pin (4) with the roll pin hole on the shift shaft (2).
3. Install the roll pin (5) through the selector pin (3) and the shift shaft (1).

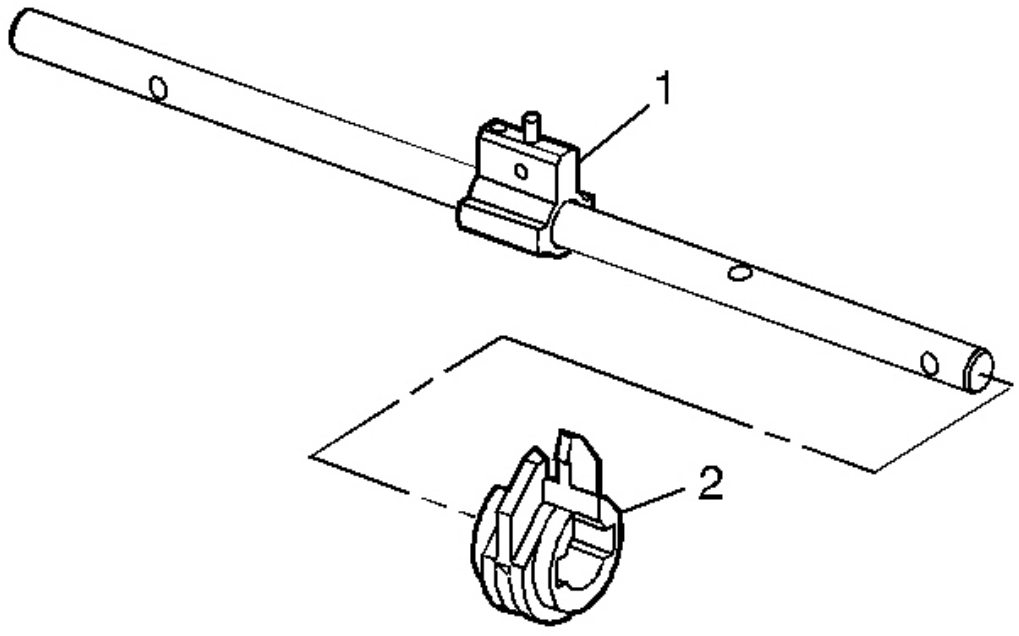


Fig. 272: Locating Interlocking Plate On Selector Pin
Courtesy of GENERAL MOTORS CORP.

4. Install the interlocking plate (2) on the selector pin (1).

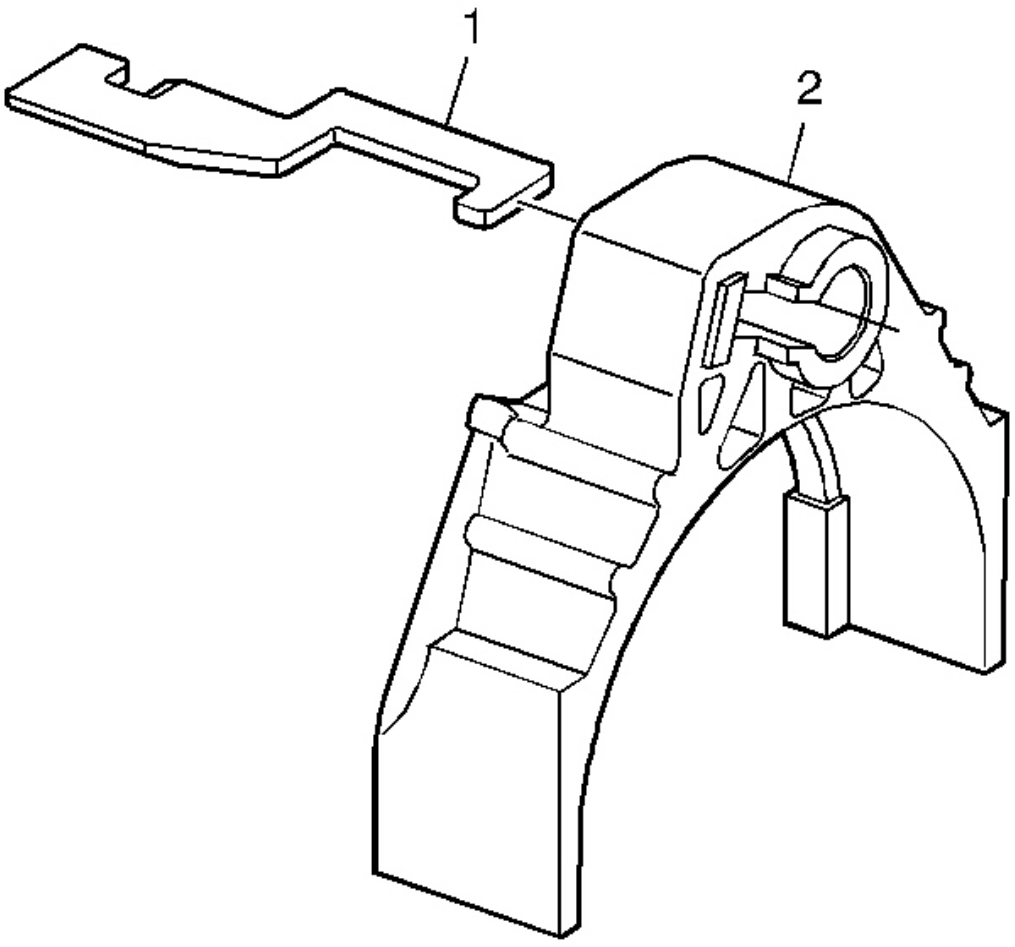


Fig. 273: View Of Shift Link In 3rd/4th Shift Fork
Courtesy of GENERAL MOTORS CORP.

5. Install the shift link (1) in the 3rd/4th shift fork (2).

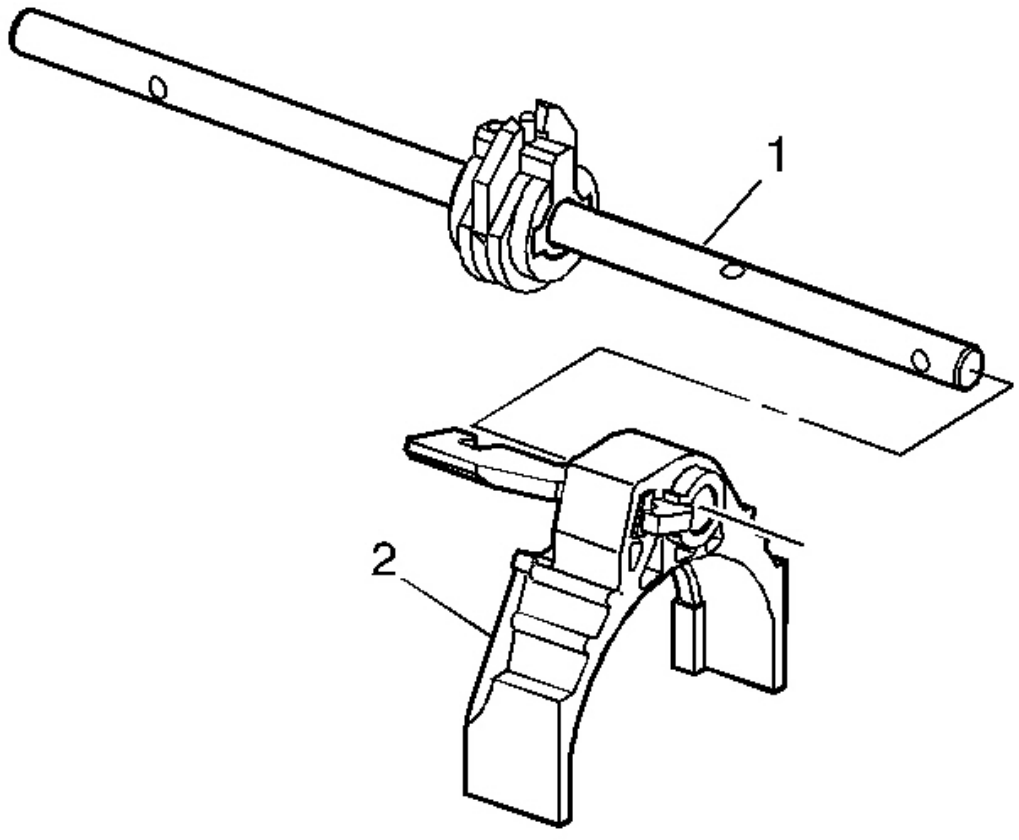


Fig. 274: Identifying 3rd/4th Shift Fork & Shift Shaft
Courtesy of GENERAL MOTORS CORP.

6. Install the 3rd/4th shift fork (2) on the shift shaft (1).

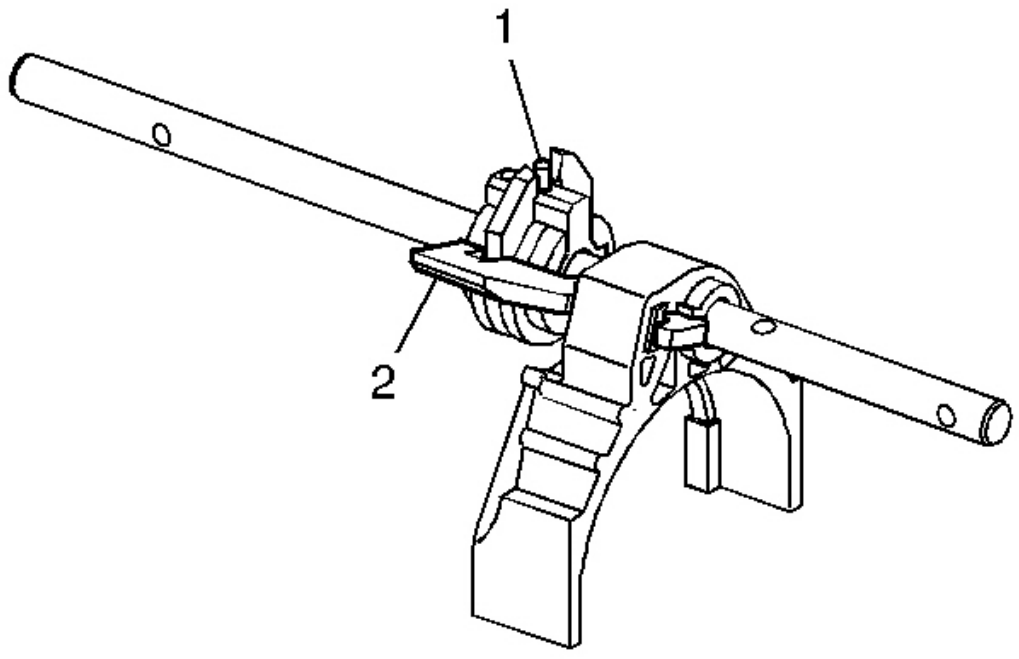


Fig. 275: Aligning Notch On Shift Link With Selector Roll Pin
Courtesy of GENERAL MOTORS CORP.

7. Align the notch on the shift link (2) with the selector roll pin (1).

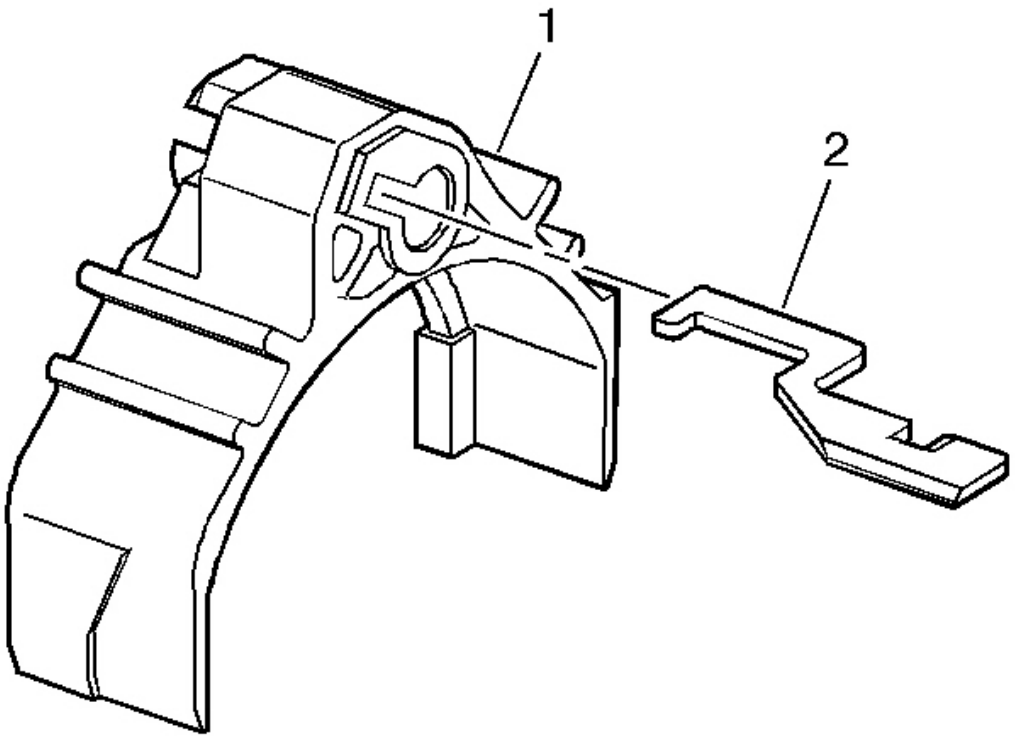


Fig. 276: Locating Shift Link & 1st/2nd Shift Fork
Courtesy of GENERAL MOTORS CORP.

8. Install the shift link (2) with the 1st/2nd shift fork (1).

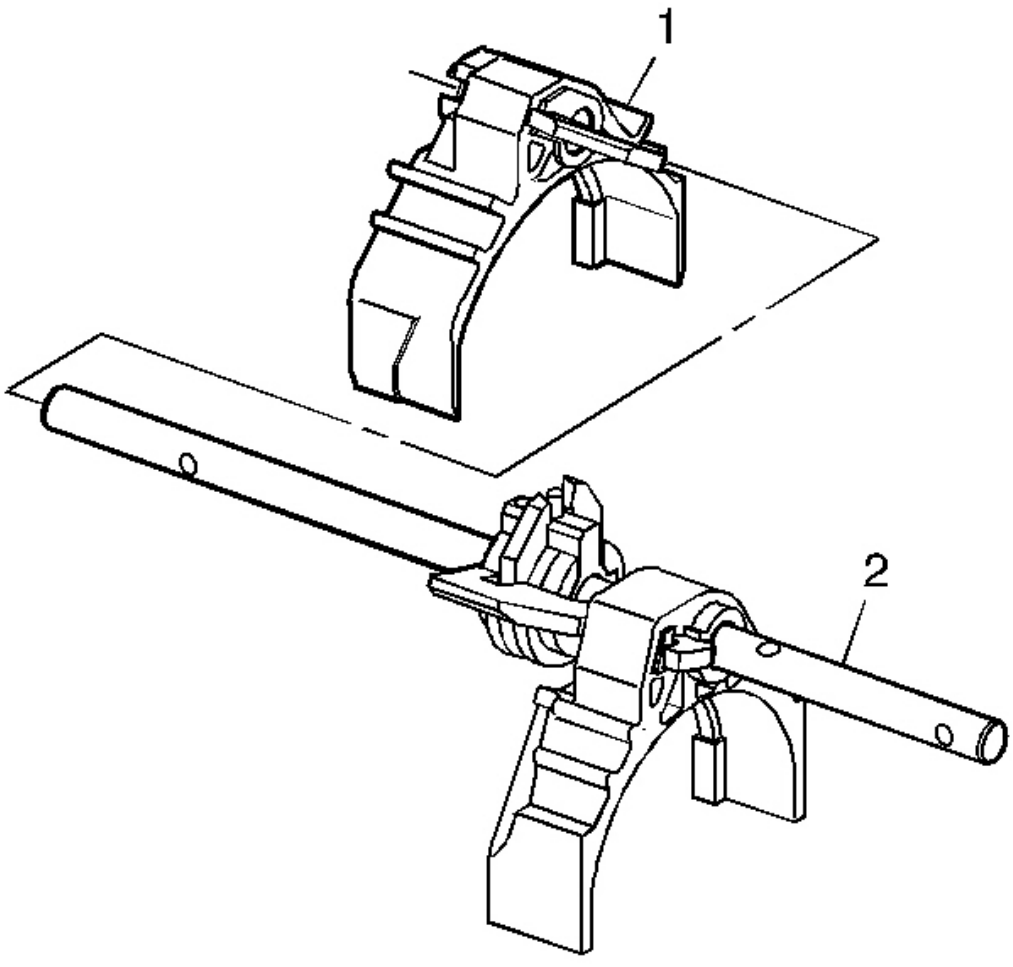


Fig. 277: View Of 1st/2nd Shift Fork On Shift Shaft
Courtesy of GENERAL MOTORS CORP.

9. Install the 1st/2nd shift fork (1) on the shift shaft (2).

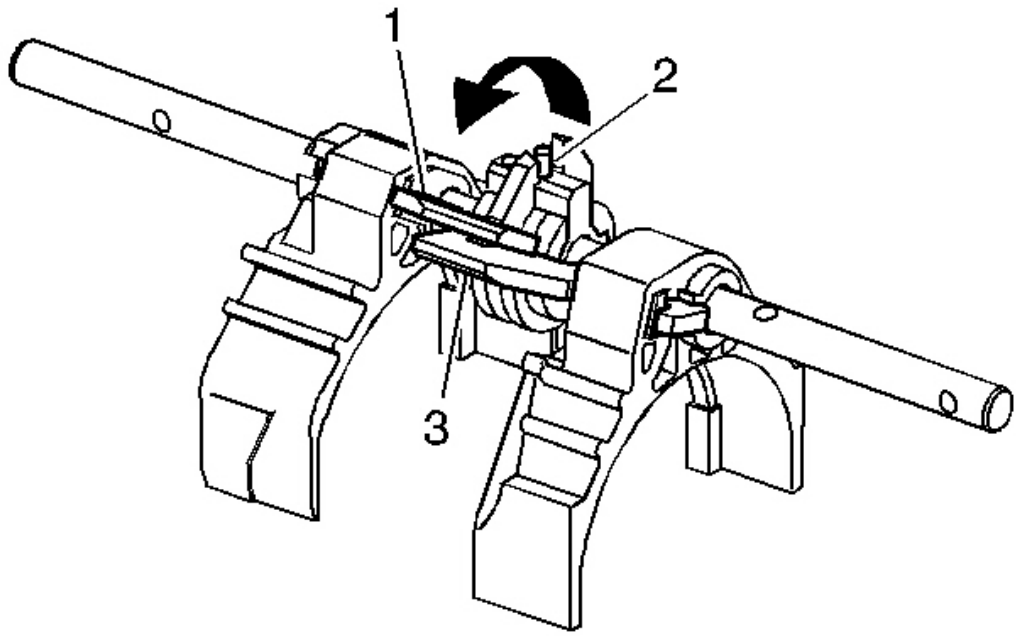


Fig. 278: View Of 1st/2nd Shift Shaft Link, 3rd/4th Shift Shaft Link & Selector Roll Pin Assembly
Courtesy of GENERAL MOTORS CORP.

10. Install the 1st/2nd shift shaft link (1) on top of the 3rd/4th shift shaft link (3) on the interlocking plate and the selector roll pin assembly (2).

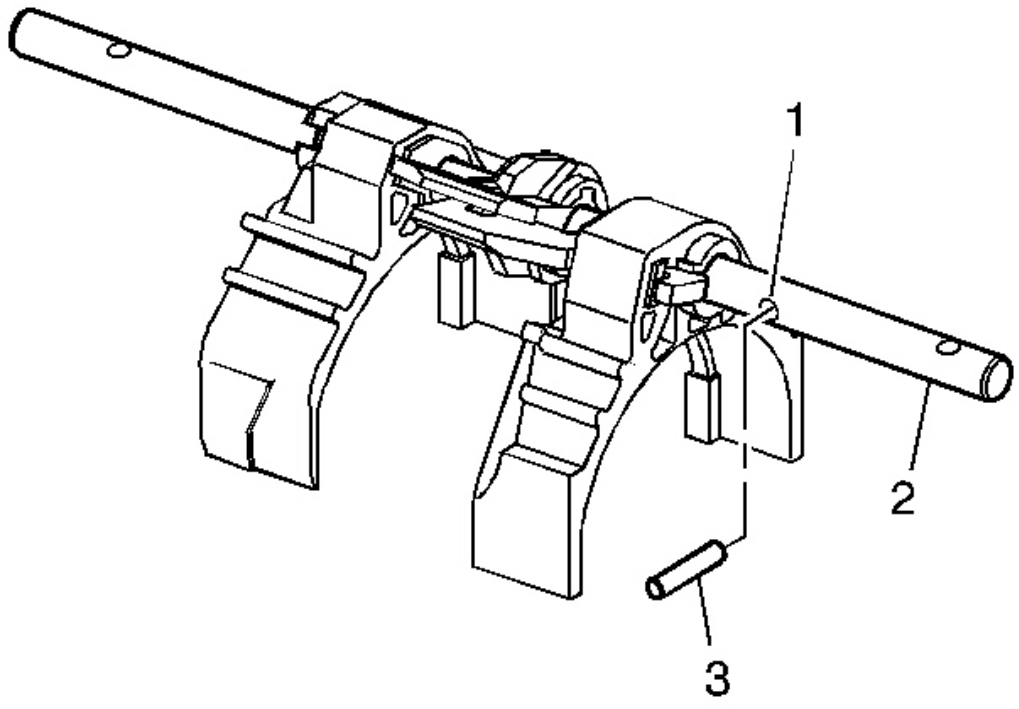


Fig. 279: View Of Neutral Return Cam Pin In Shift Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The neutral return cam pin fits loosely in the shift shaft. Use the J 36850 to hold the neutral return cam pin in place. See Special Tools.

11. Install the neutral return cam pin (3) in the neutral return can pin hole (1) on the shift shaft (2).

5th/6th, Reverse Shift Rail Assembly

Tools Required

J 39437 Bushing Installer. See **Special Tools**.

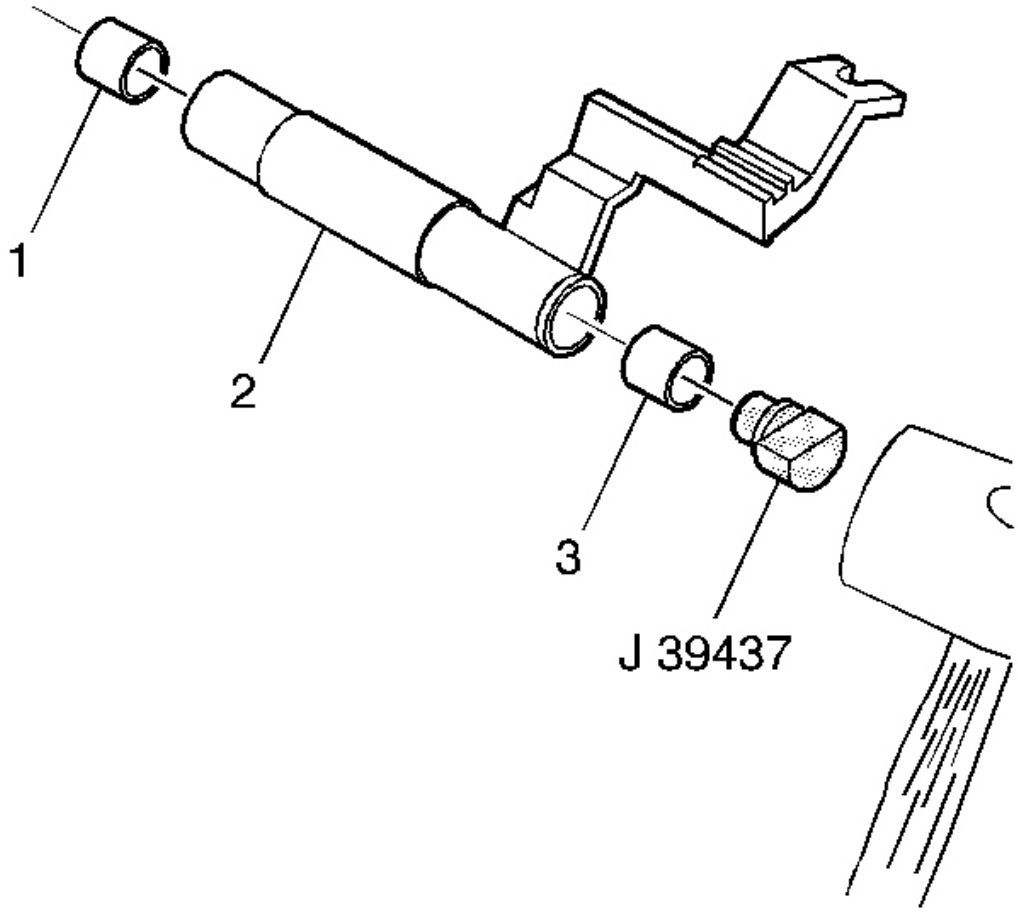


Fig. 280: Installing 5th/6th Shift Shaft Lever Bushings On 5th/6th Shift Lever
Courtesy of GENERAL MOTORS CORP.

1. Install the 5th/6th shift shaft lever bushings (1) and (3) in the 5th/6th shift lever (2) using the **J 39437** and a hammer. See **Special Tools**.

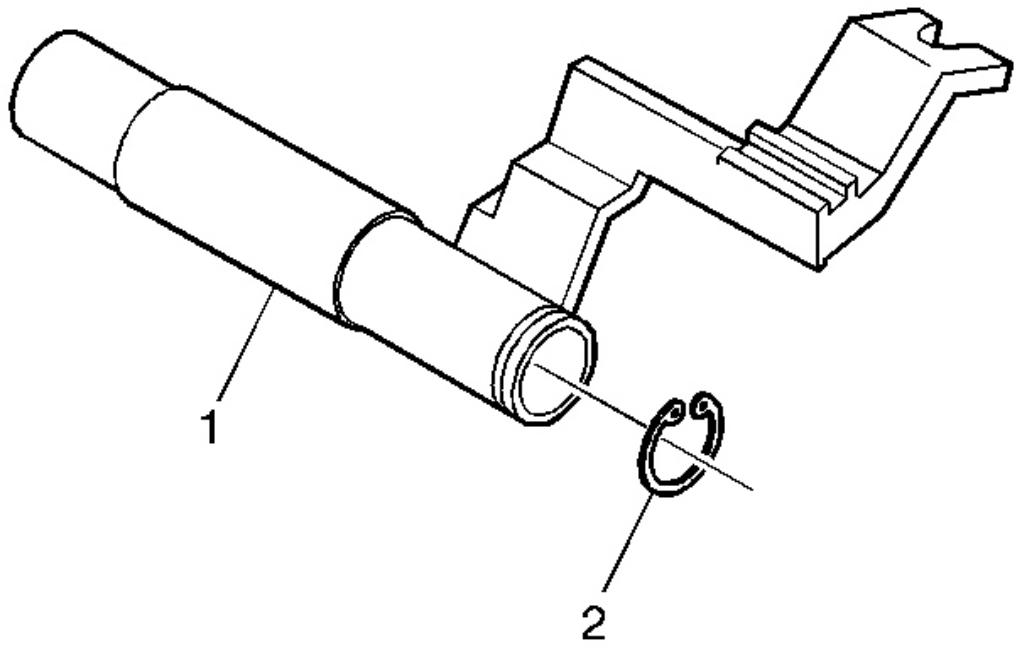


Fig. 281: Locating Retainer Ring On 5th/6th Shift Lever
Courtesy of GENERAL MOTORS CORP.

2. Install the retainer ring (1) on the 5th/6th shift lever (2).

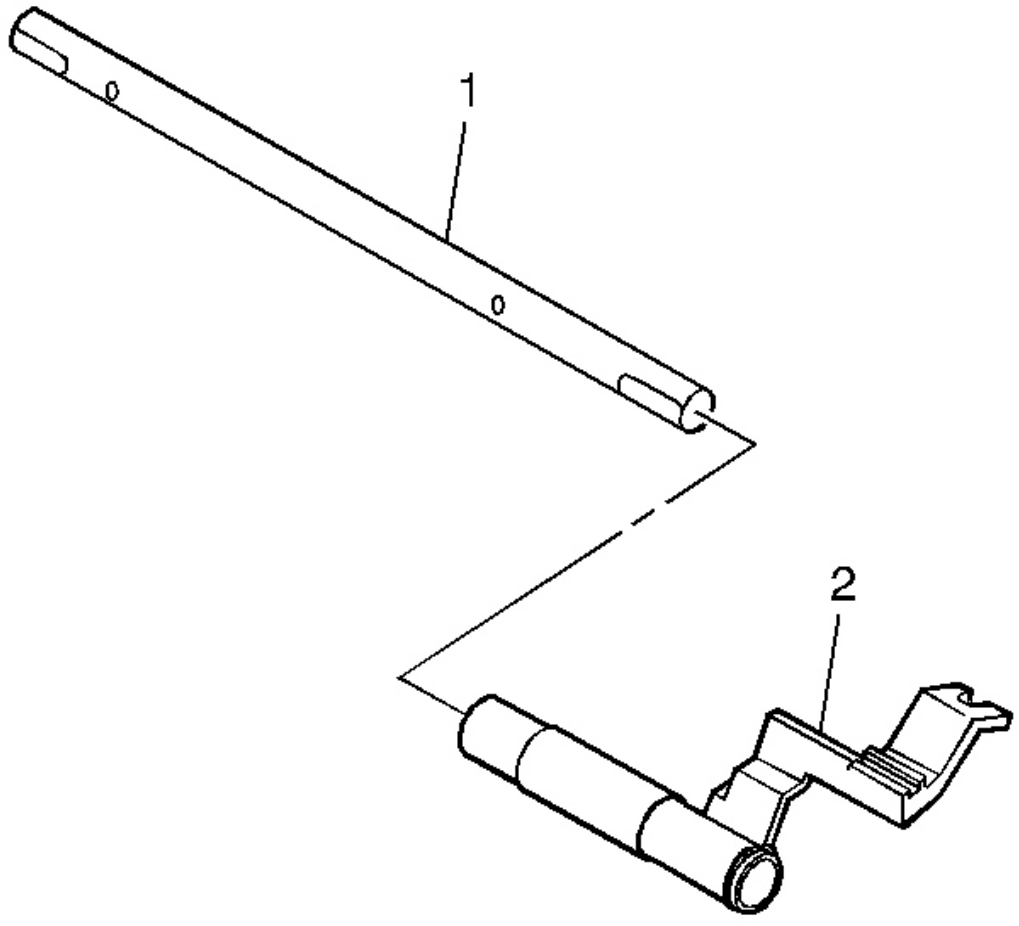


Fig. 282: Identifying 5th/6th Shift Lever
Courtesy of GENERAL MOTORS CORP.

3. Install the 5th/6th shift lever (2) on the shift shaft (1).

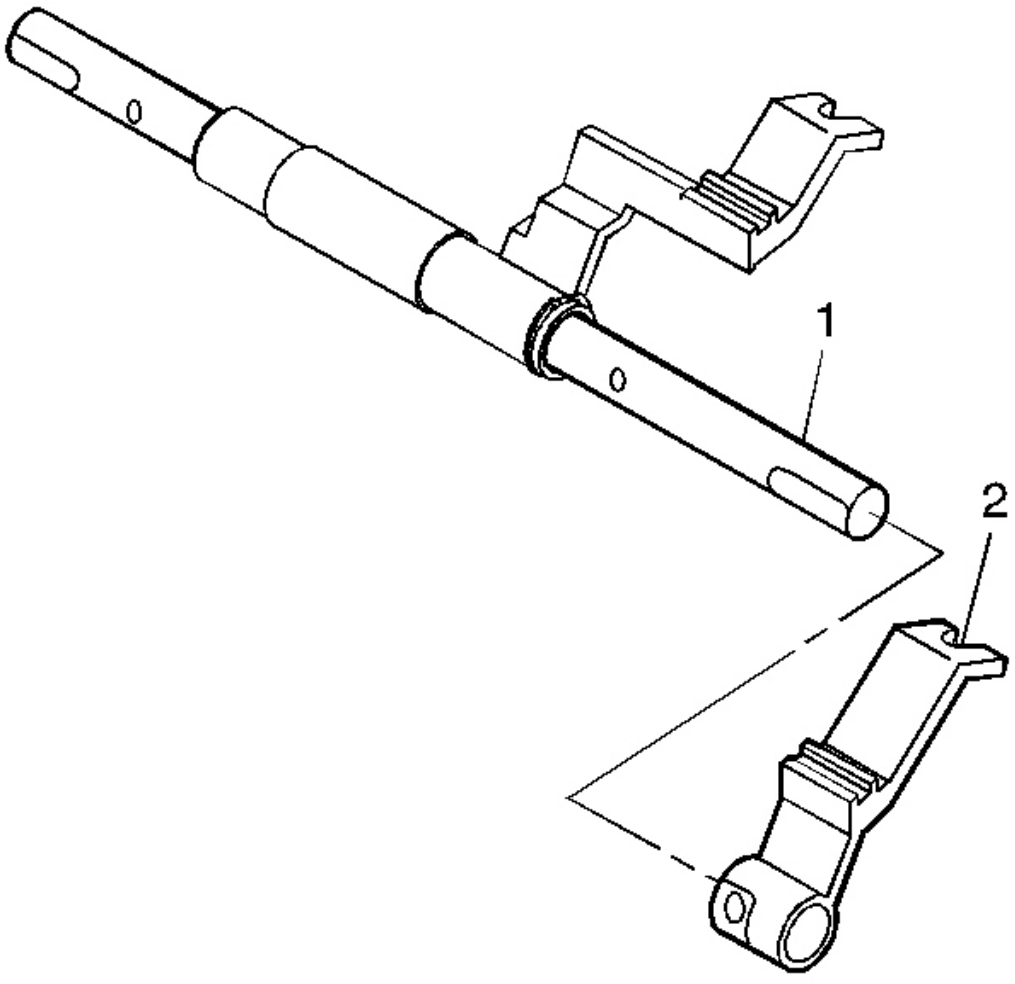


Fig. 283: View Of Reverse Shift Lever Onto Shift Shaft
Courtesy of GENERAL MOTORS CORP.

4. Install the reverse shift lever (2) on the shift shaft (1).

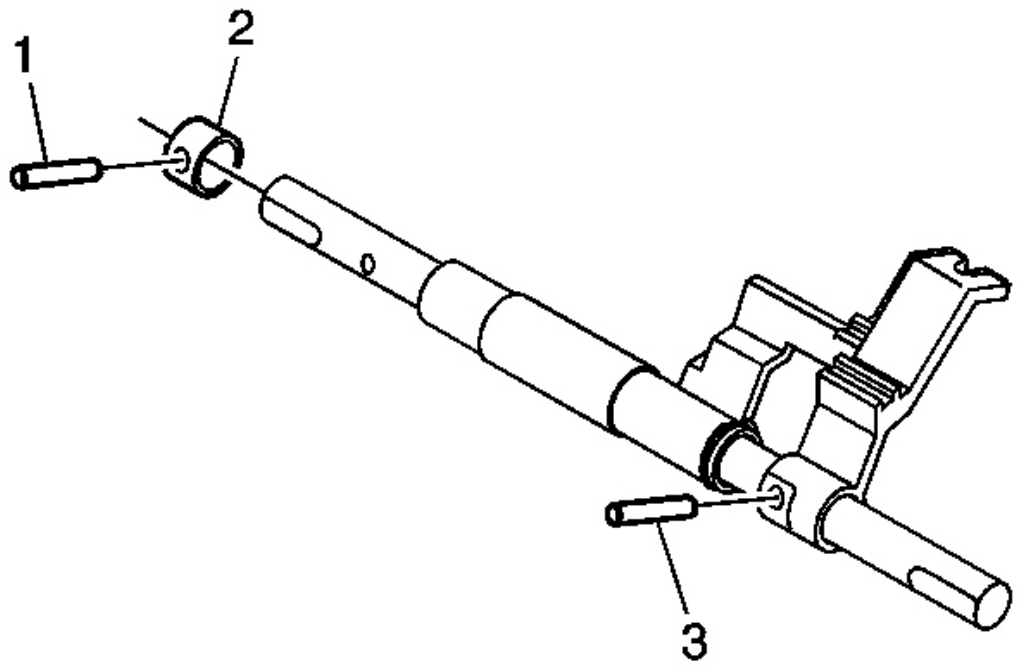


Fig. 284: View Of Reverse Lever Roll Pin, Reverse Collar & Reverse Collar Roll Pin
Courtesy of GENERAL MOTORS CORP.

5. Install the reverse lever roll pin (3).
6. Install the reverse collar (2).
7. Install the reverse collar roll pin (1).

TRANSMISSION CASE AND ADAPTER DISASSEMBLE

Transmission Case

Tools Required

- **J 8092** Universal Driver Handle
- **J 23907** Slide Hammer
- **J 39439-2** Bushing Remover. See **Special Tools**.
- **J 39790** Mainshaft Bearing Race Remover. See **Special Tools**.
- **J 39791** Countershaft Bearing Race Remover. See **Special Tools**.

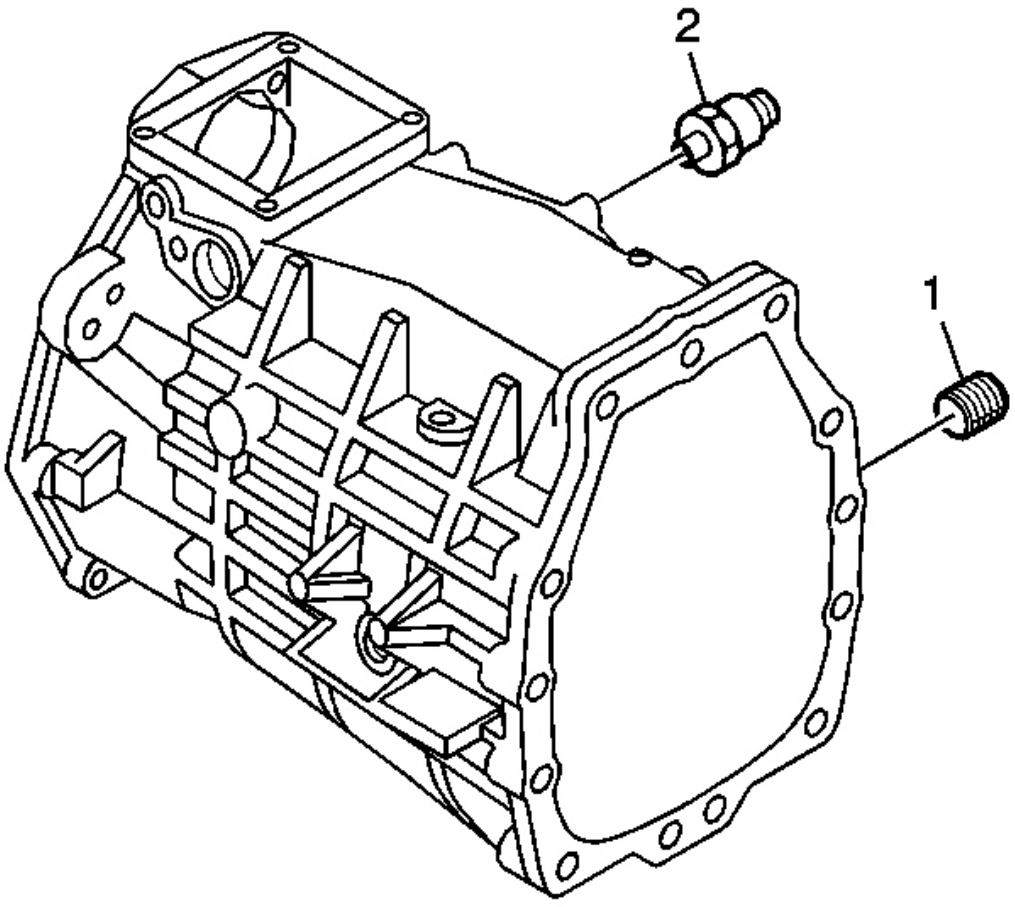


Fig. 285: View Of Transmission Case Fill Plug & Coolant Temperature Switch
Courtesy of GENERAL MOTORS CORP.

1. Remove the transmission case fill plug (1) (MM6 only).
2. Remove the coolant temperature switch (2) (MY6 only).

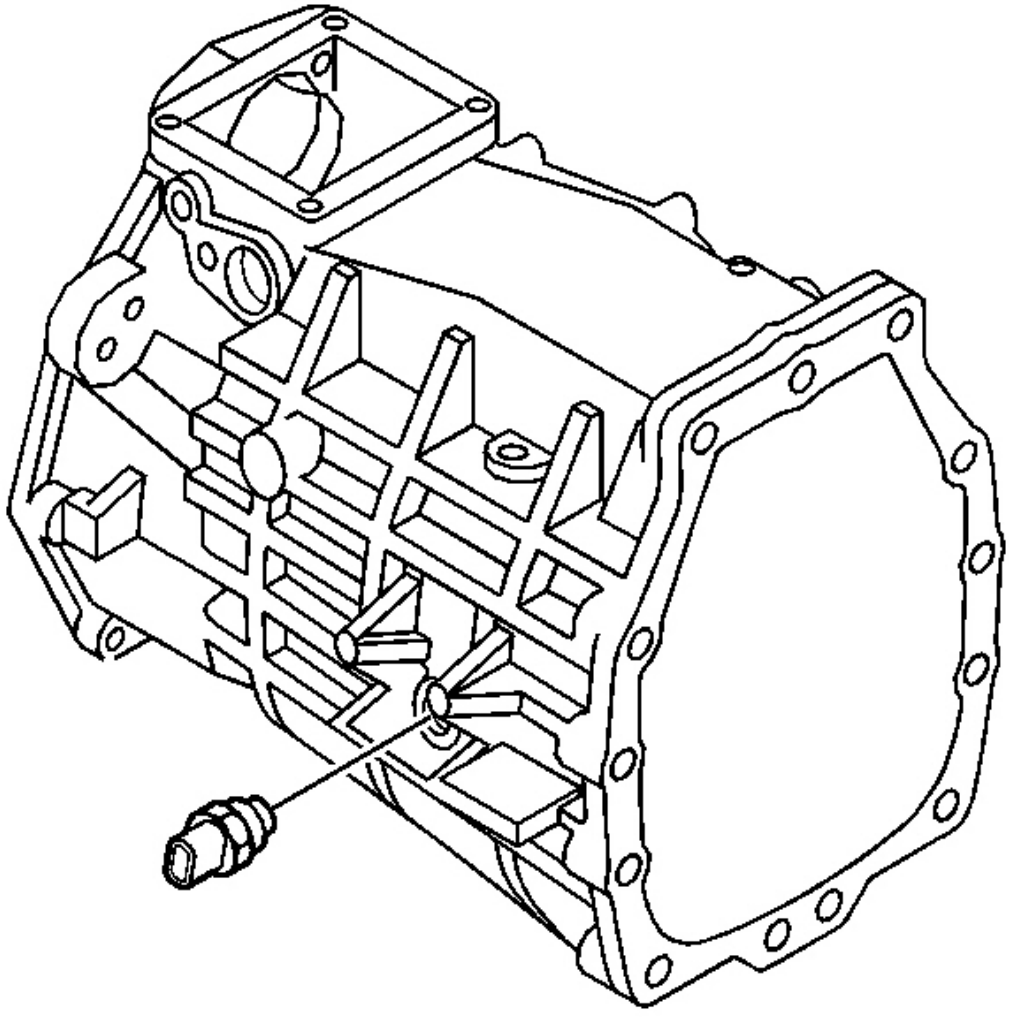


Fig. 286: View Of Reverse Lamp Switch
Courtesy of GENERAL MOTORS CORP.

3. Remove the reverse lamp switch (MM6 only).

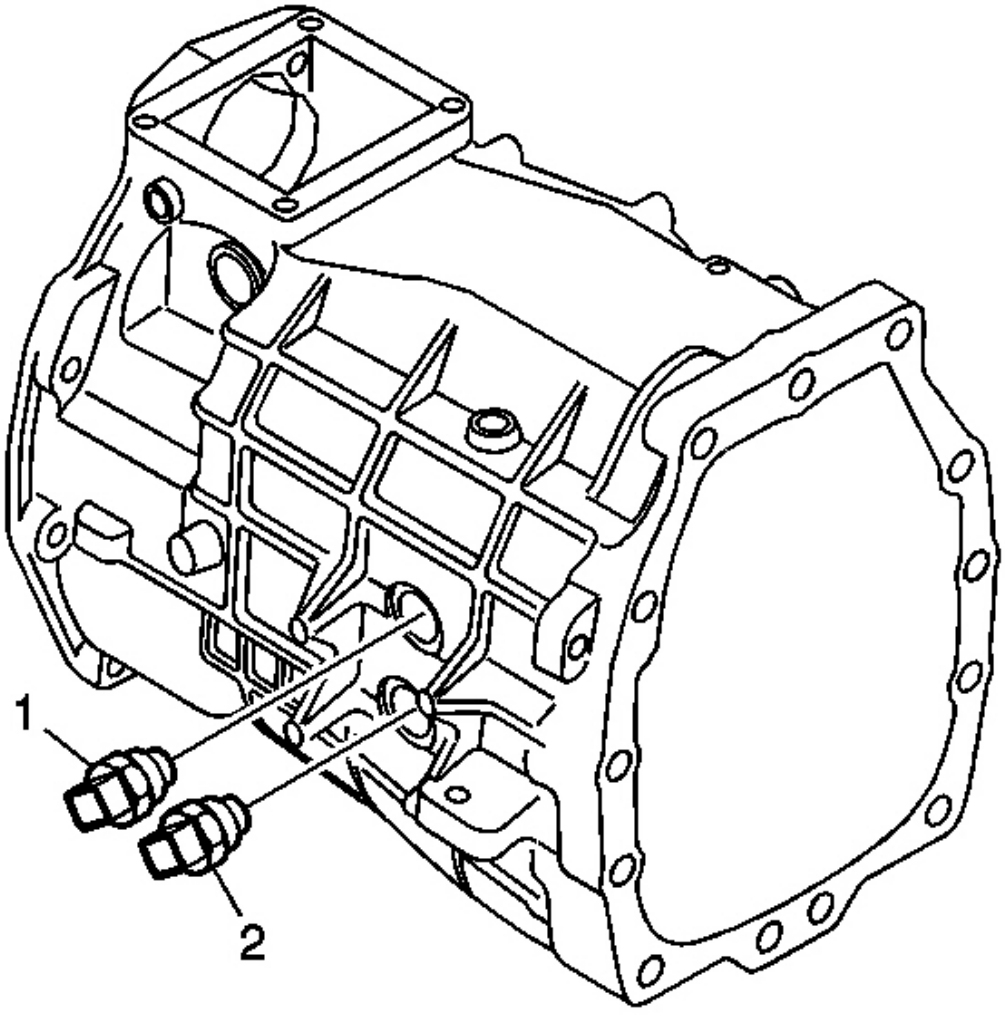


Fig. 287: View Of E-Z Key Switch
Courtesy of GENERAL MOTORS CORP.

4. Remove the E-Z key switch (1) (MY6 only).

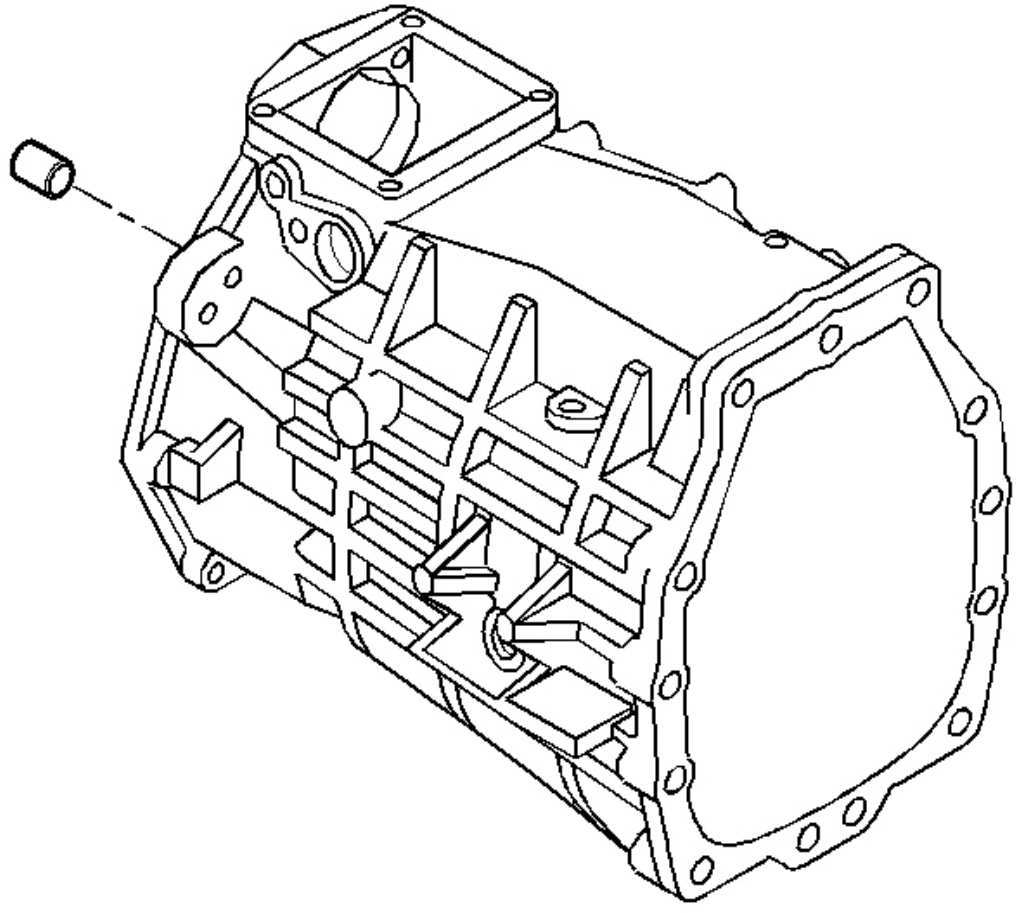


Fig. 288: Identifying Transfer Case Dowel Pins
Courtesy of GENERAL MOTORS CORP.

5. Remove the dowel pins.

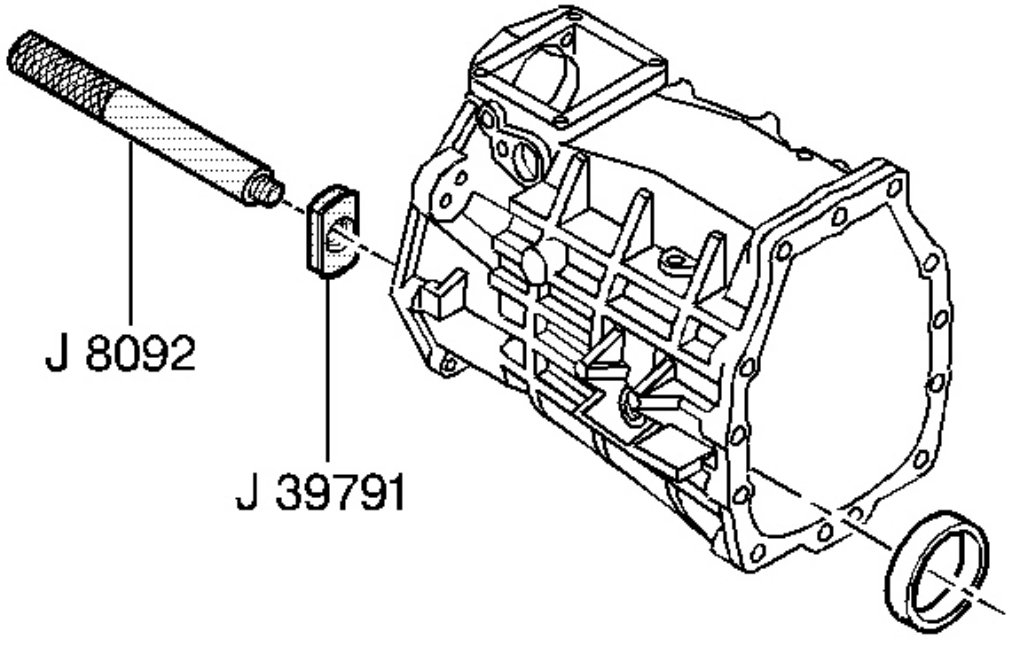


Fig. 289: View Of Countershaft Bearing Race, J 8092 & J 39791
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not replace the bearing race unless inspection shows bearing race damage.

6. Remove the countershaft bearing race, using the **J 8092** and the **J 39791** . See **Special Tools**.

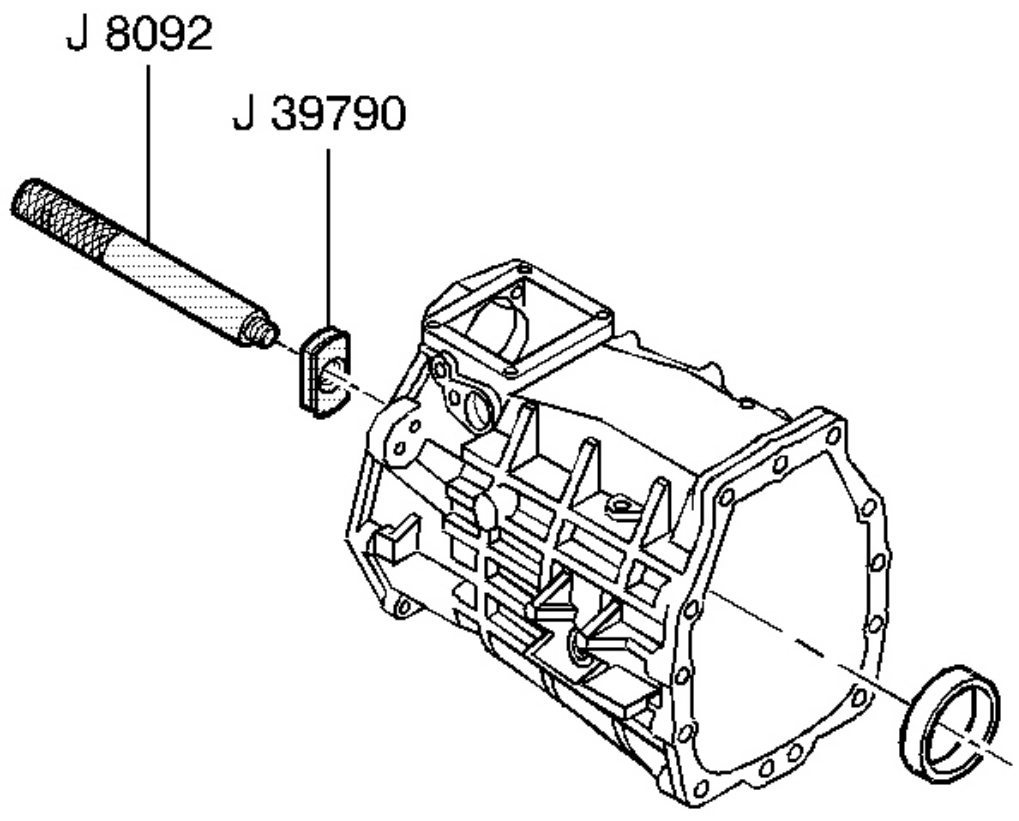


Fig. 290: View Of Mainshaft Bearing Race & Special Tools
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not replace the bearing race unless inspection shows bearing race damage.

7. Remove the mainshaft bearing race, using the **J 8092** and the **J 39790** . See **Special Tools**.

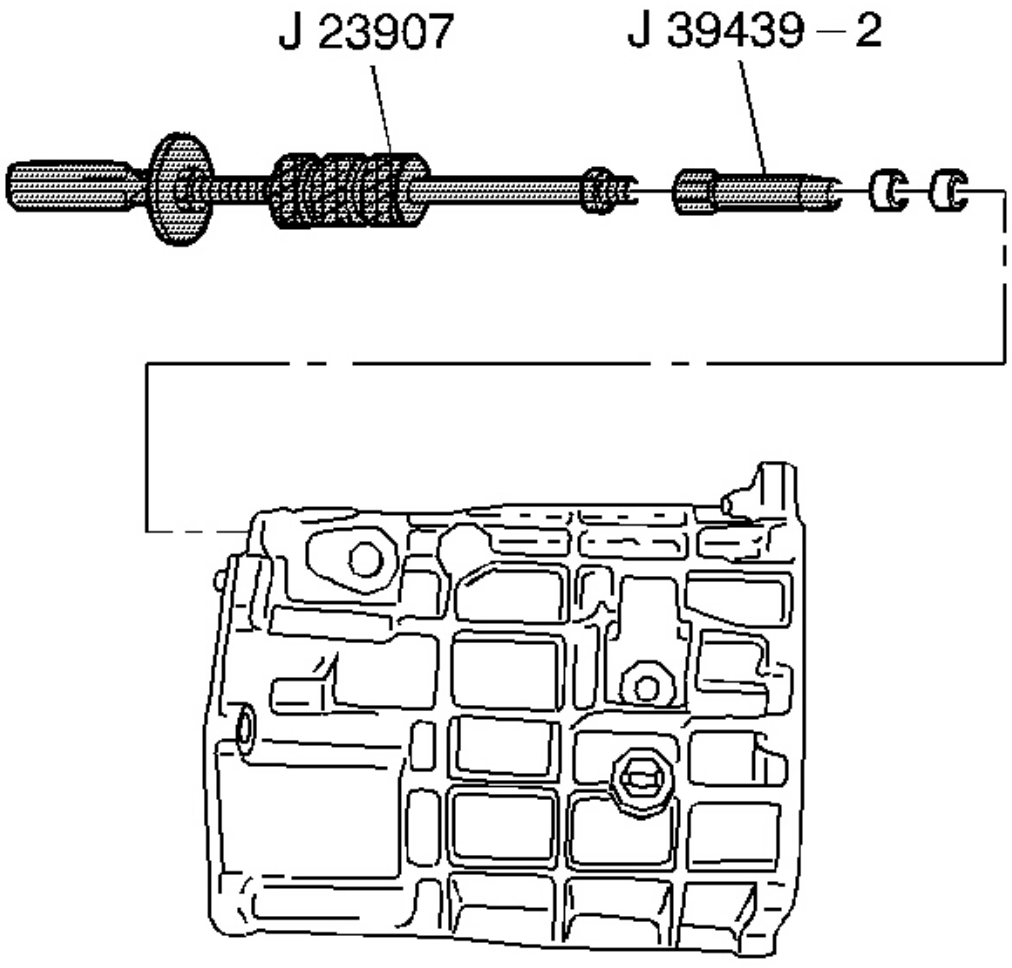


Fig. 291: View Of 1st/2nd & 3rd/4th Shift Shaft Bushings & Special Tools
Courtesy of GENERAL MOTORS CORP.

8. Remove the 1st/2nd and the 3rd/4th shift shaft bushings, using the **J 23907** and the **J 39439-2** . See **Special Tools**.

Adapter Plate

Tools Required

- **J 23907** Slide Hammer
- **J 39439-2** Bushing Remover. See **Special Tools**.

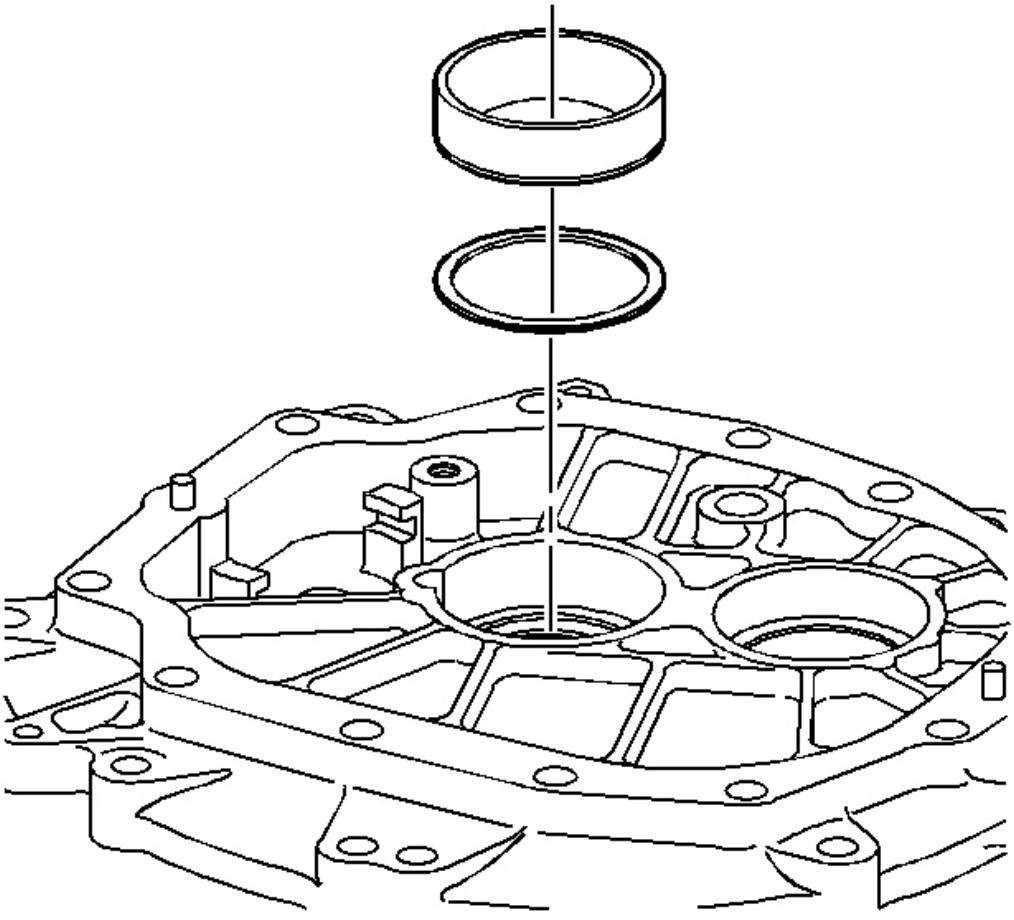


Fig. 292: View Of Input Shaft Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

1. Remove the input shaft bearing race and the shim.

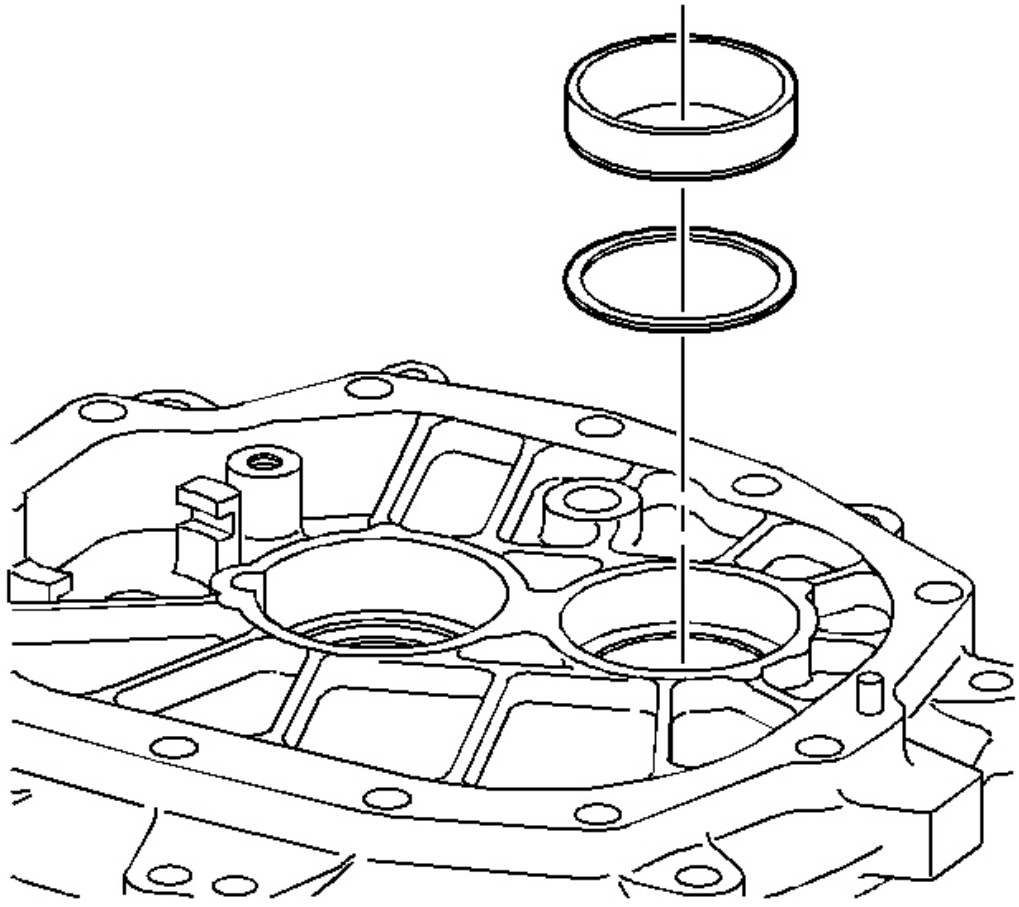


Fig. 293: Identifying Countershaft Bearing Shim & Bearing Race
Courtesy of GENERAL MOTORS CORP.

2. Remove the countershaft bearing race and the shim.

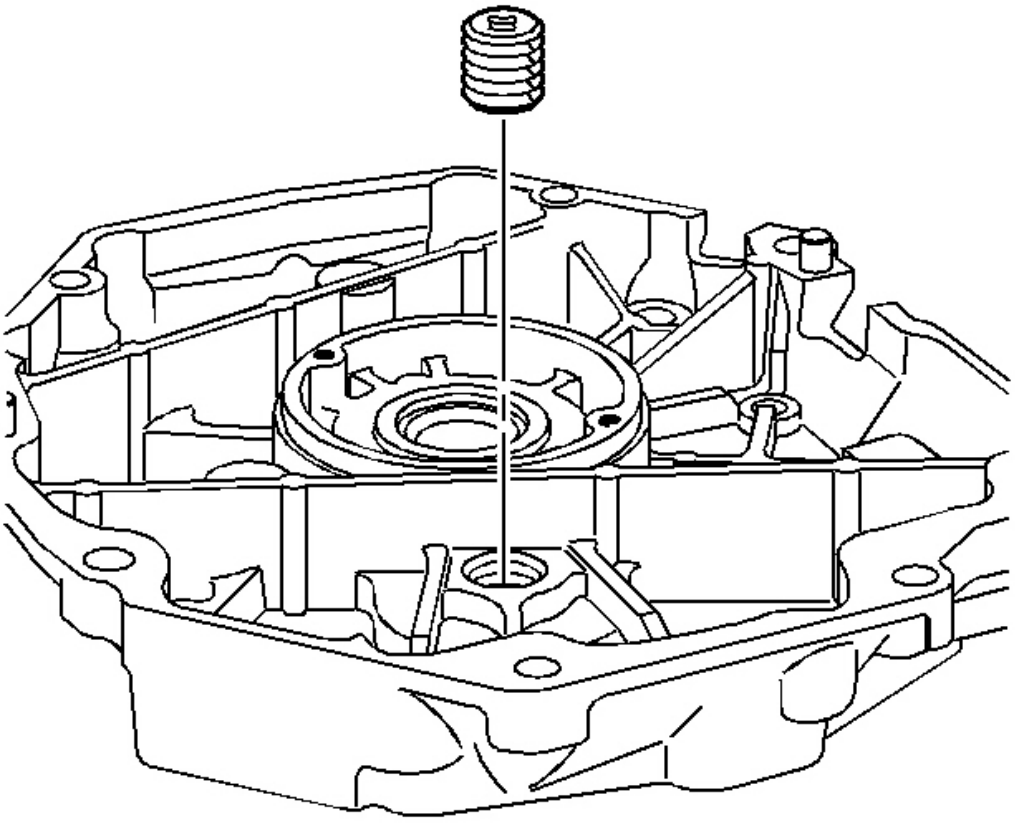


Fig. 294: Identifying Adapter Plate Plug
Courtesy of GENERAL MOTORS CORP.

3. Remove the adapter plate plug (MM6 only).

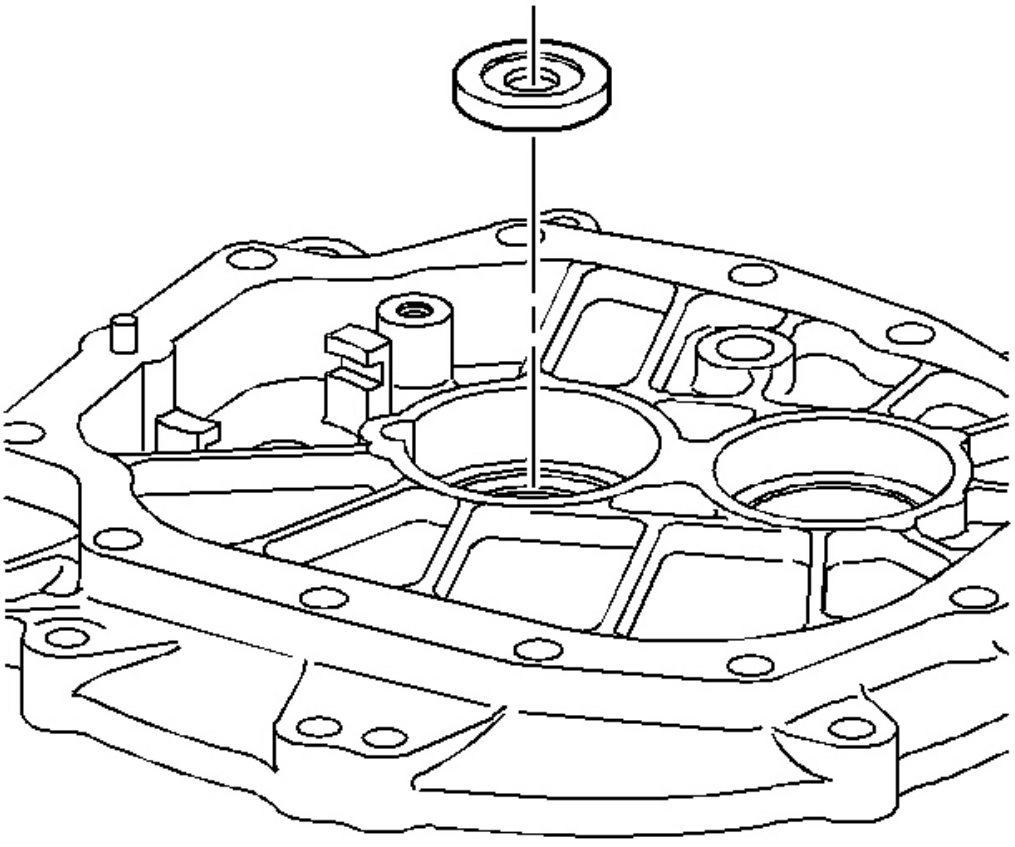


Fig. 295: Identifying Input Shaft Seal
Courtesy of GENERAL MOTORS CORP.

4. Remove the input shaft seal.

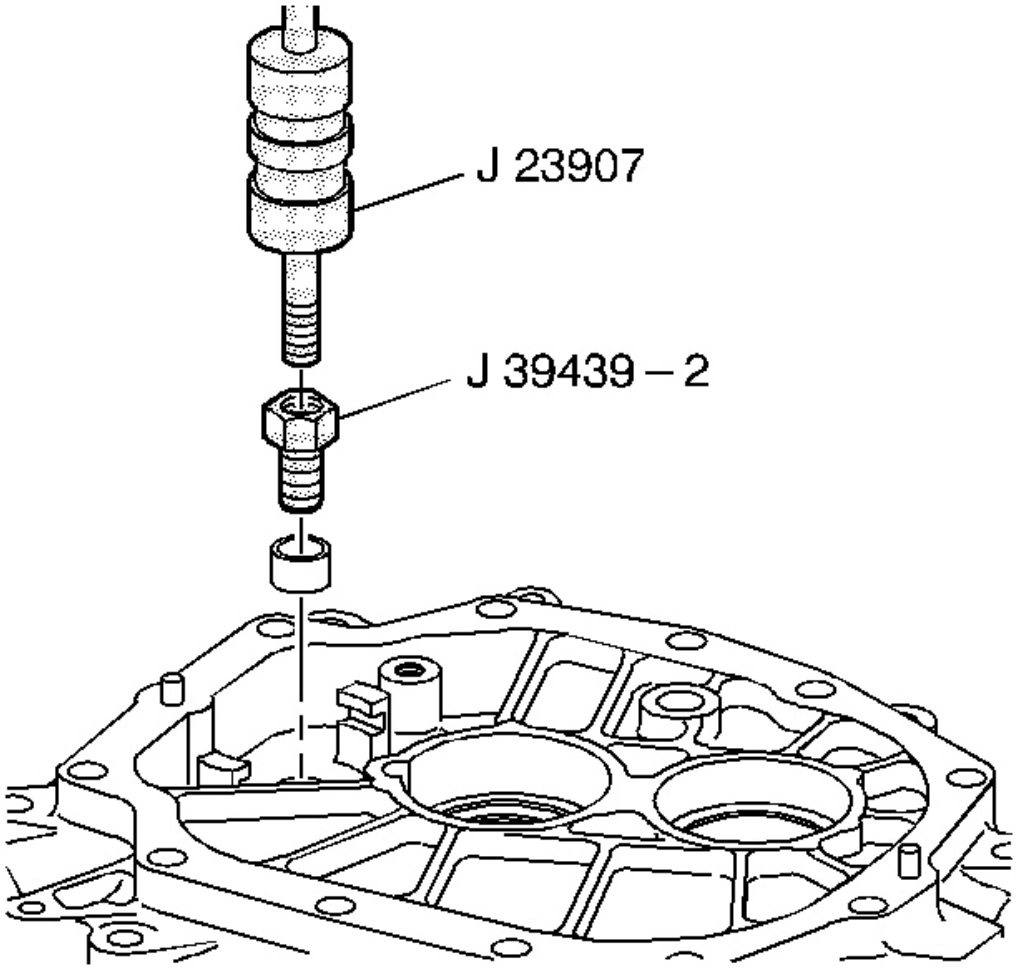


Fig. 296: View Of 1st/2nd & 3rd/4th Shift Shaft Bushing & Special Tools
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not replace the bushing unless inspection shows bushing damage.

5. Remove the 1st/2nd and the 3rd/4th shift shaft bushing, using the **J 23907** with the **J 39439-2** . See **Special Tools**.

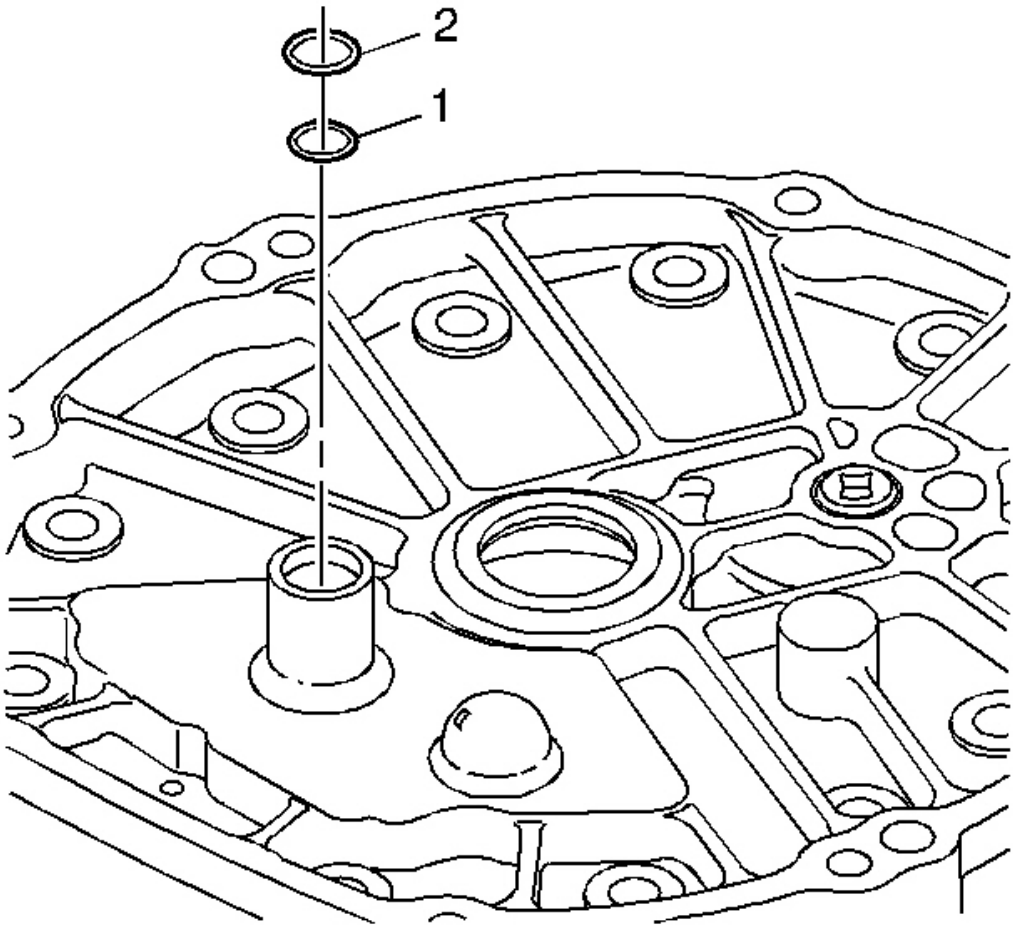


Fig. 297: View Of Shift Shaft Seals
Courtesy of GENERAL MOTORS CORP.

6. Remove the 1st/2nd and the 3rd/4th shift shaft seals (1) and (2).

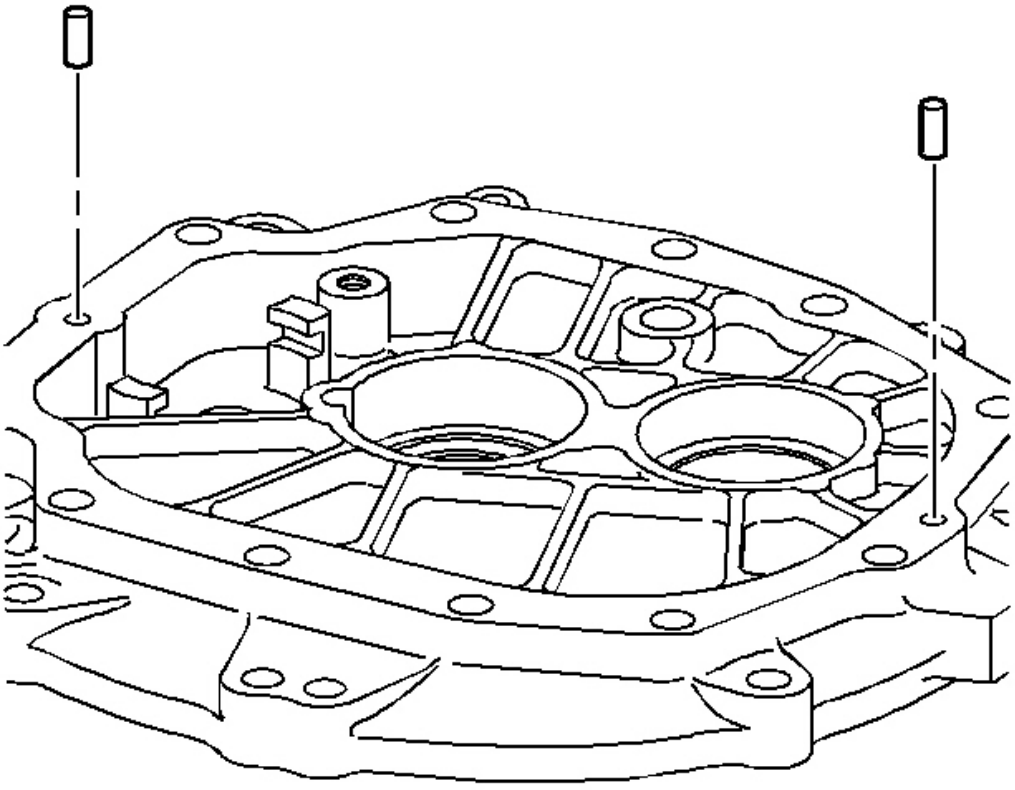


Fig. 298: View Of Transmission Dowel Pins
Courtesy of GENERAL MOTORS CORP.

7. Remove the dowel pins.

TRANSMISSION CASE AND ADAPTER CLEANING AND INSPECTION

Transmission Case

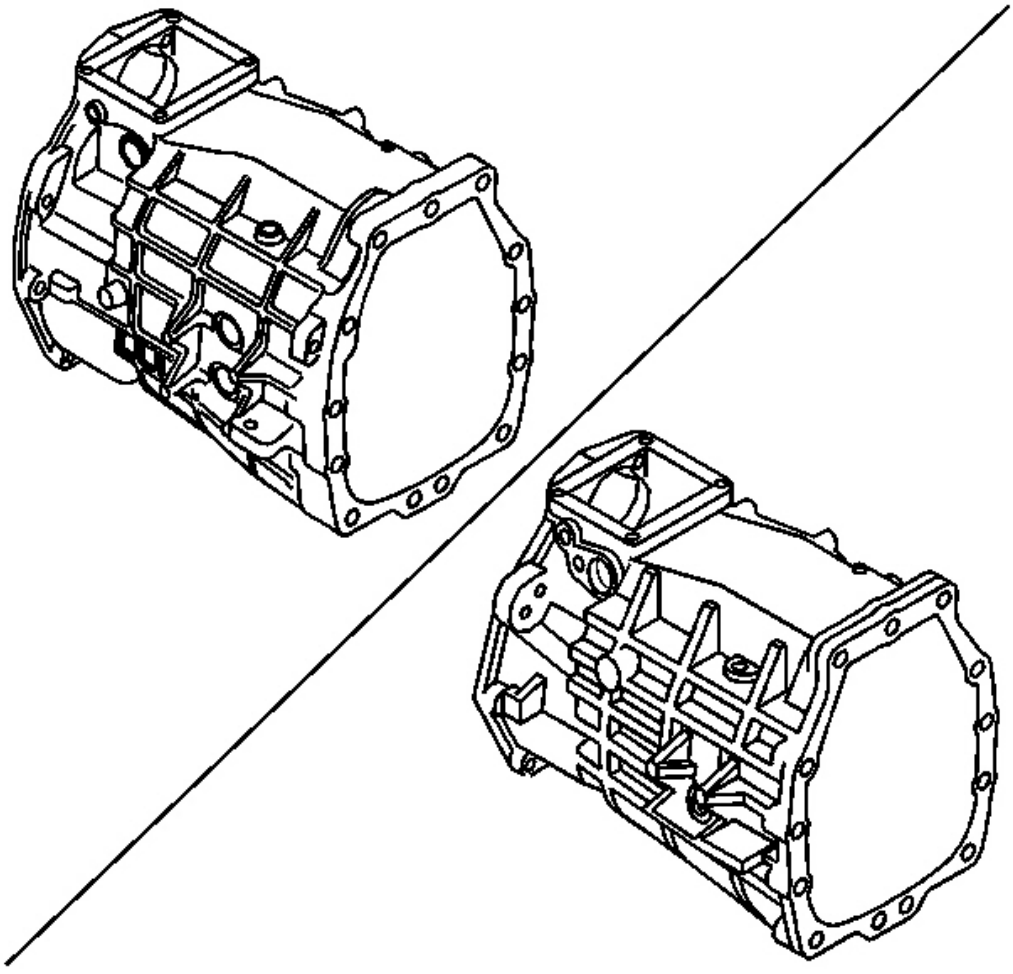


Fig. 299: View Of Transmission Case
Courtesy of GENERAL MOTORS CORP.

1. Clean the transmission case in a suitable solvent. Air dry the transmission case.
2. Clean all sealant material from retainer bolt threads.
3. Inspect the transmission case for the following conditions:
    - Cracks
    - Scratches
    - Damaged threads
    - Burrs

- Nicked mounting surfaces
- Damaged sealing surfaces
- Damaged front or rear bearing bores

4. Inspect the machined mating surfaces for flatness with a straight edge.
5. Inspect the bearing races and bores for wear, scratches or grooves.
6. Inspect the bushing for excessive wear.
7. Use a fine mill file to dress minor scratches or burrs.
8. If scratches, or grooves or scoring cannot be removed by hand with a soft stone or crocus cloth, replace the component.
9. Clean up damaged threads with the correct size tap.
10. Replace a cracked housing.
11. Replace worn bushings.

Adapter Plate

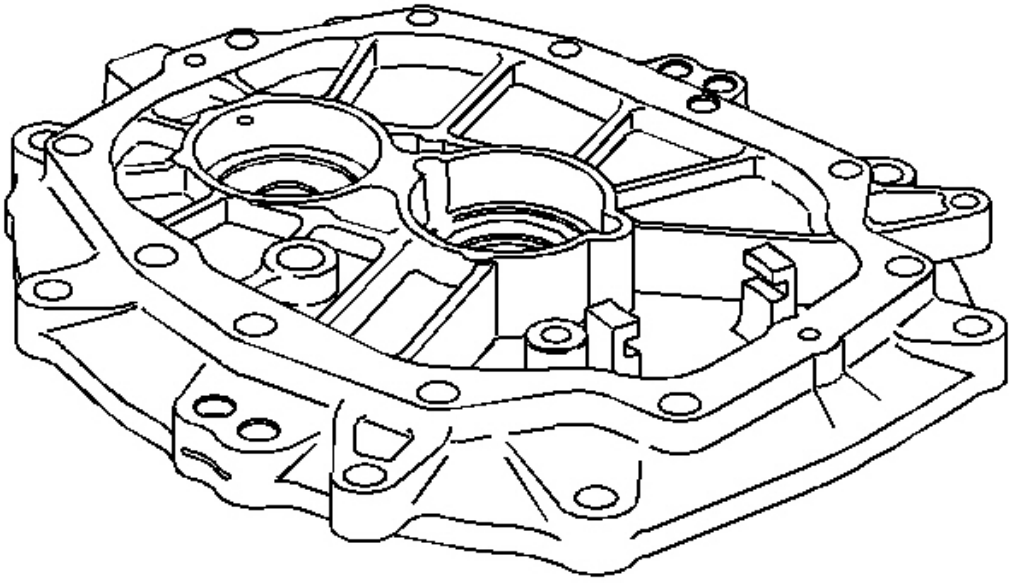


Fig. 300: View Of Adapter Plate
Courtesy of GENERAL MOTORS CORP.

1. Clean the adapter plate parts with a suitable solvent. Air dry all the parts.
2. Inspect the adapter plate parts for the following conditions:
   - Cracks

     Replace the adapter plate parts if cracks are found.

   - Scratches
   - Burrs
   - Nicked mounting surfaces
   - Damaged sealing surfaces
   - Damaged front or rear bearing bores
3. Inspect the machined mating surfaces for flatness. Check the mating surfaces with a straight edge.
4. Inspect the bearing races and bores for wear, scratches or grooves.
5. Inspect the bushing for excessive wear. Replace worn bushings.
6. Use a fine mill file to dress minor scratches or burrs.
7. If scratches, or grooves or scoring cannot be removed by hand with a soft stone or crocus cloth, replace the component.

TRANSMISSION CASE AND ADAPTER ASSEMBLE

Transmission Case

Tools Required

- **J 8092** Universal Driver Handle
- **J 36190** Universal Driver Handle. See **Special Tools**.
- **J 39435** Bearing Race Installer. See **Special Tools**.
- **J 39439-4** Bushing Installer. See **Special Tools**.
- **J 39439-3** Bushing Installer. See **Special Tools**.

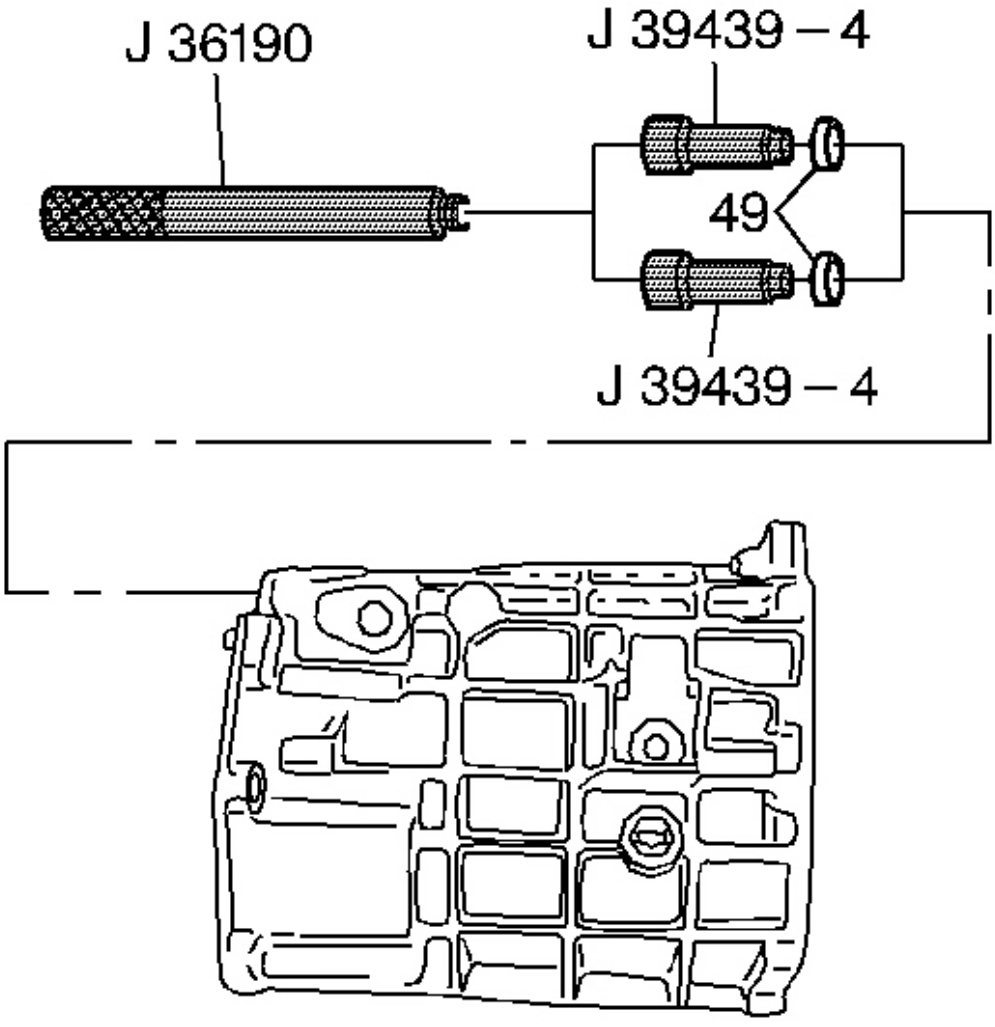


Fig. 301: View Of 1st/2nd & 3rd/4th Shift Shaft Bushings
Courtesy of GENERAL MOTORS CORP.

1. Install the lst/2nd and the 3rd/4th shift shaft bushings. Use the **J 36190** , the **J 39439-4** , and the **J 39439-3** . See **Special Tools**.

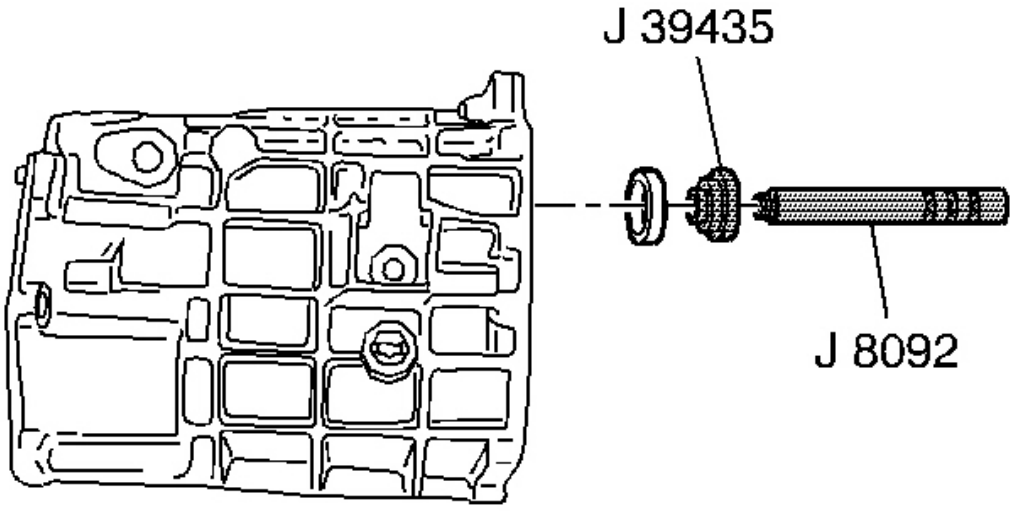


Fig. 302: View Of Mainshaft Bearing Race, J 8092 & J 39435
Courtesy of GENERAL MOTORS CORP.

2. Install the mainshaft bearing race, using the **J 8092** and the **J 39435** . See **Special Tools**.

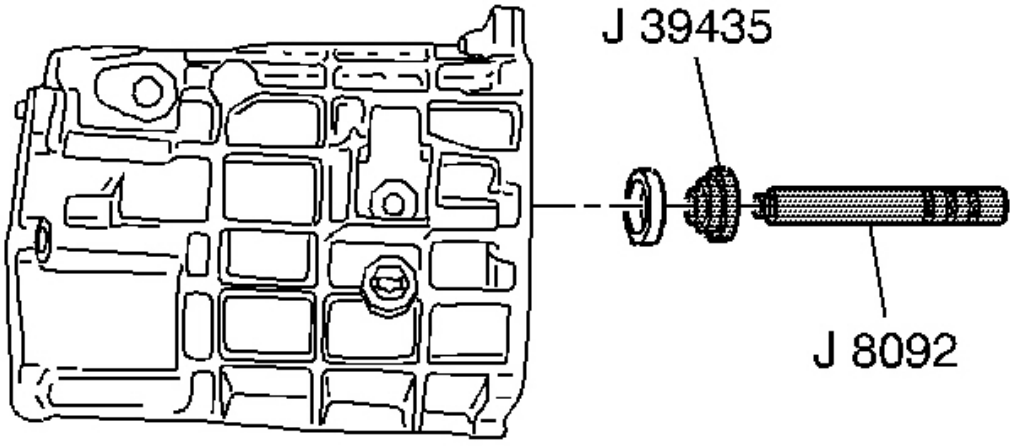


Fig. 303: View Of Countershaft Bearing Race, J 8092 & J 39435

Courtesy of GENERAL MOTORS CORP.

3. Install the countershaft bearing race, using the **J 8092** and the **J 39435** . See **Special Tools**.

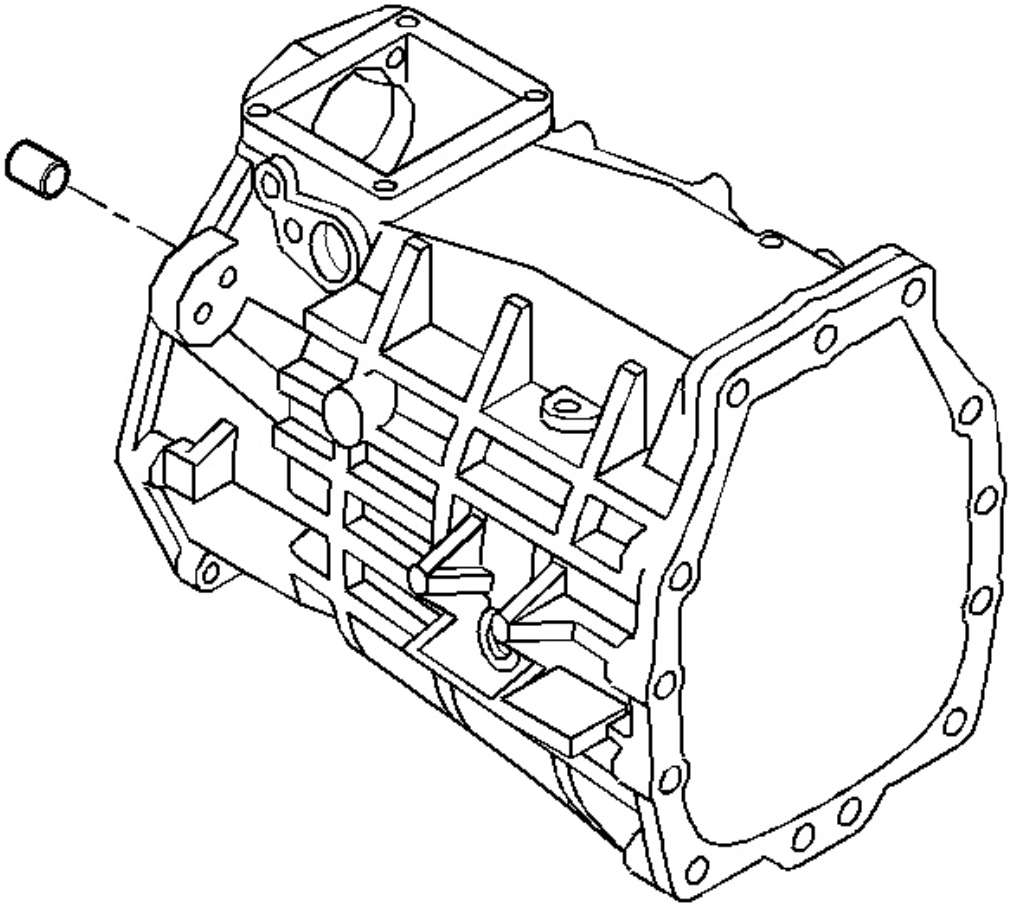


Fig. 304: Identifying Transfer Case Dowel Pins
Courtesy of GENERAL MOTORS CORP.

4. Install the dowel pins.

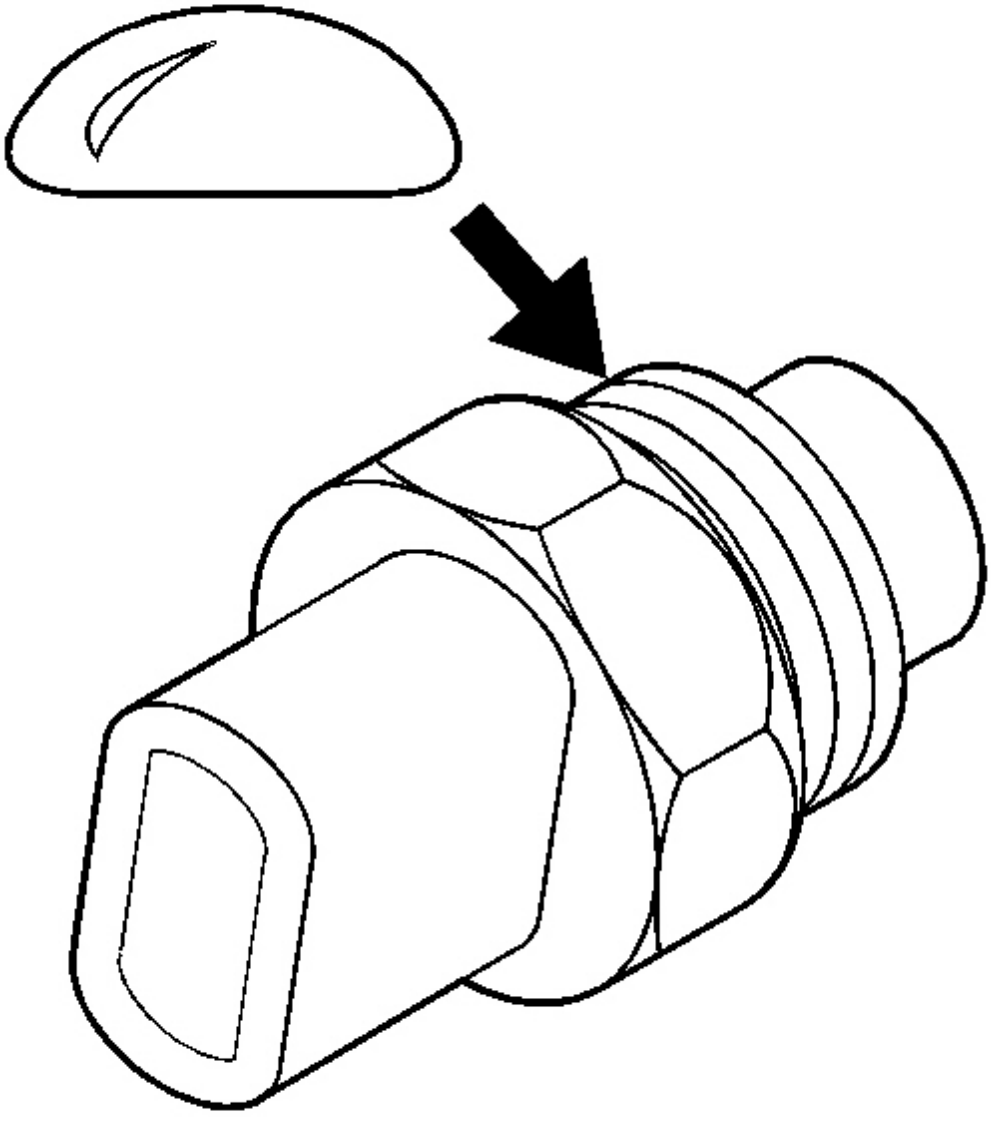


Fig. 305: Applying Sealant To Threads On Reverse Lamp Switch
Courtesy of GENERAL MOTORS CORP.

5. Apply sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent to the threads of the reverse lamp switch.

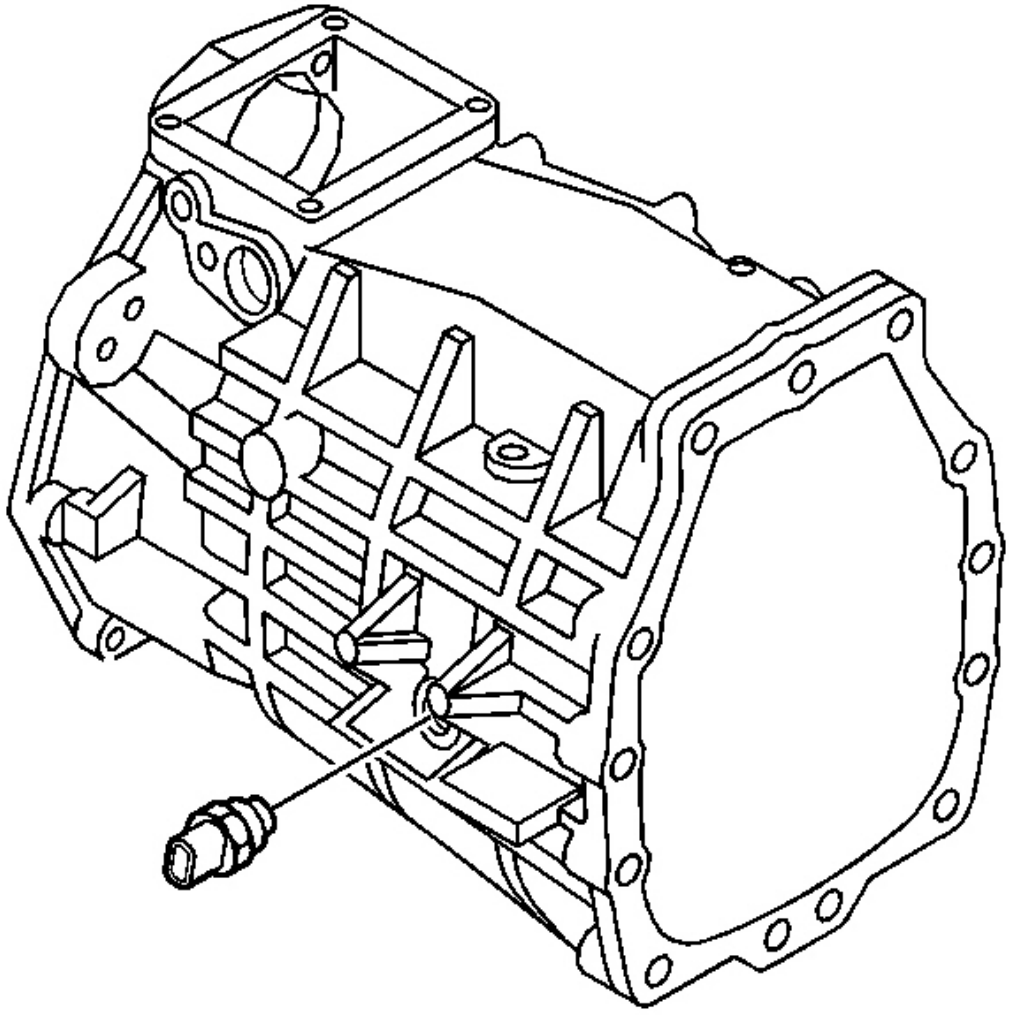


Fig. 306: View Of Reverse Lamp Switch
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

6. Install the reverse lamp switch.

   Tighten: Tighten the switch to 27 N.m (20 lb ft).

7. Install the coolant temperature sensor (MY6 only).

Tighten: Tighten the sensor to 39 N.m (29 lb ft).

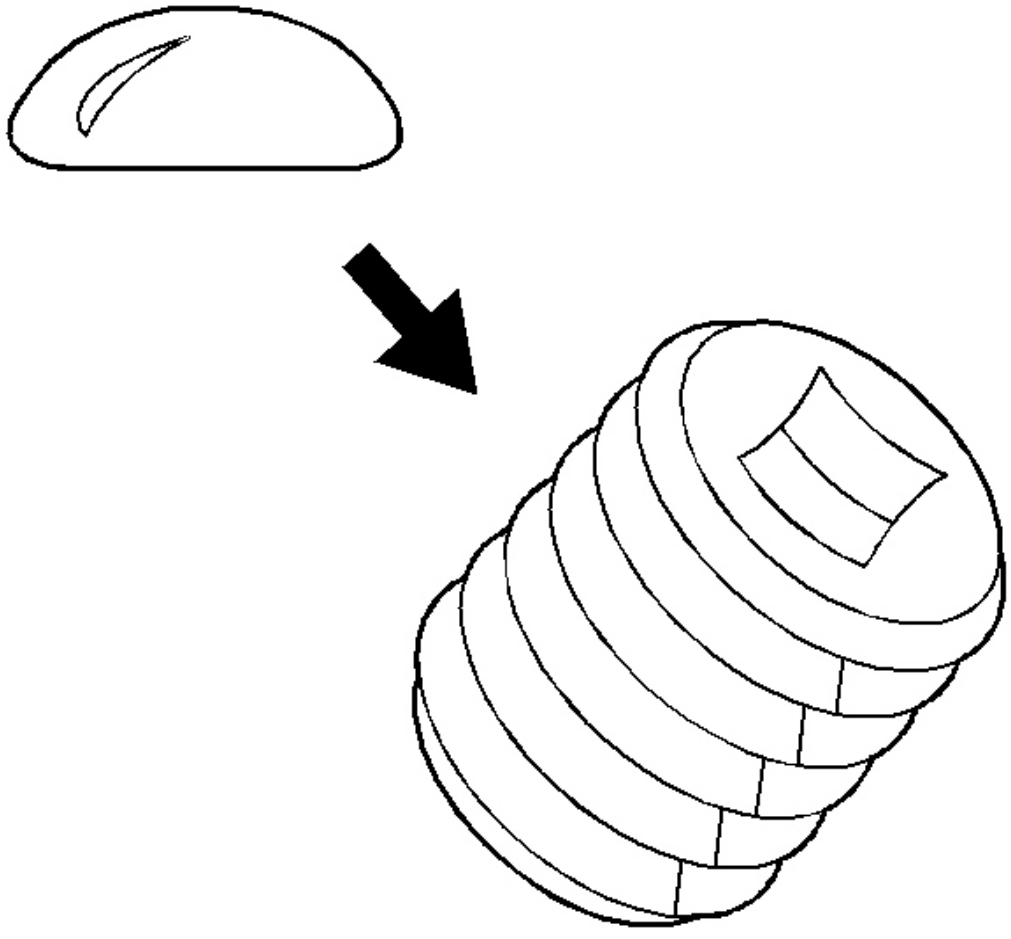


Fig. 307: Applying Sealant To Adapter Plate Plug Threads
Courtesy of GENERAL MOTORS CORP.

8. Apply sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent to the threads of the transmission case fill plug, MM6 only.

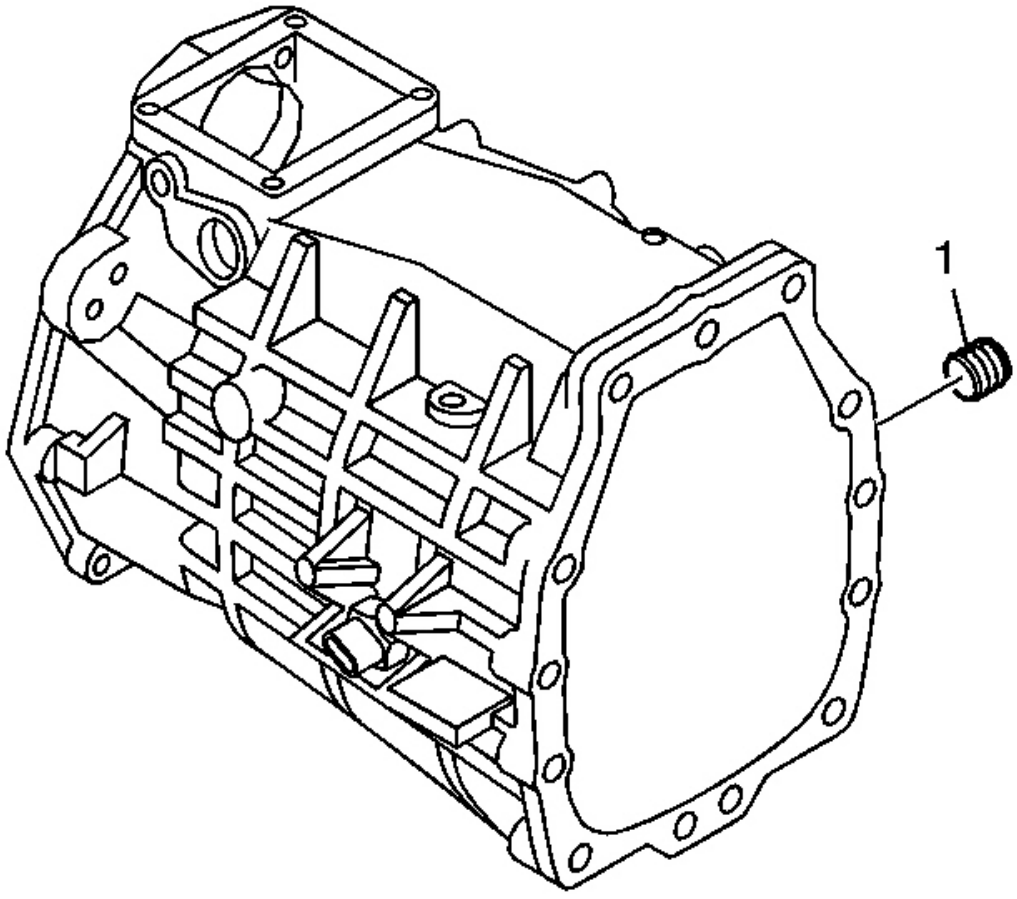


Fig. 308: View Of Transmission Case Fill Plug
Courtesy of GENERAL MOTORS CORP.

9. Install the transmission case fill plug (1), MM6 only.

   Tighten: Tighten the transmission case fill plug to 18 N.m (13 lb ft).

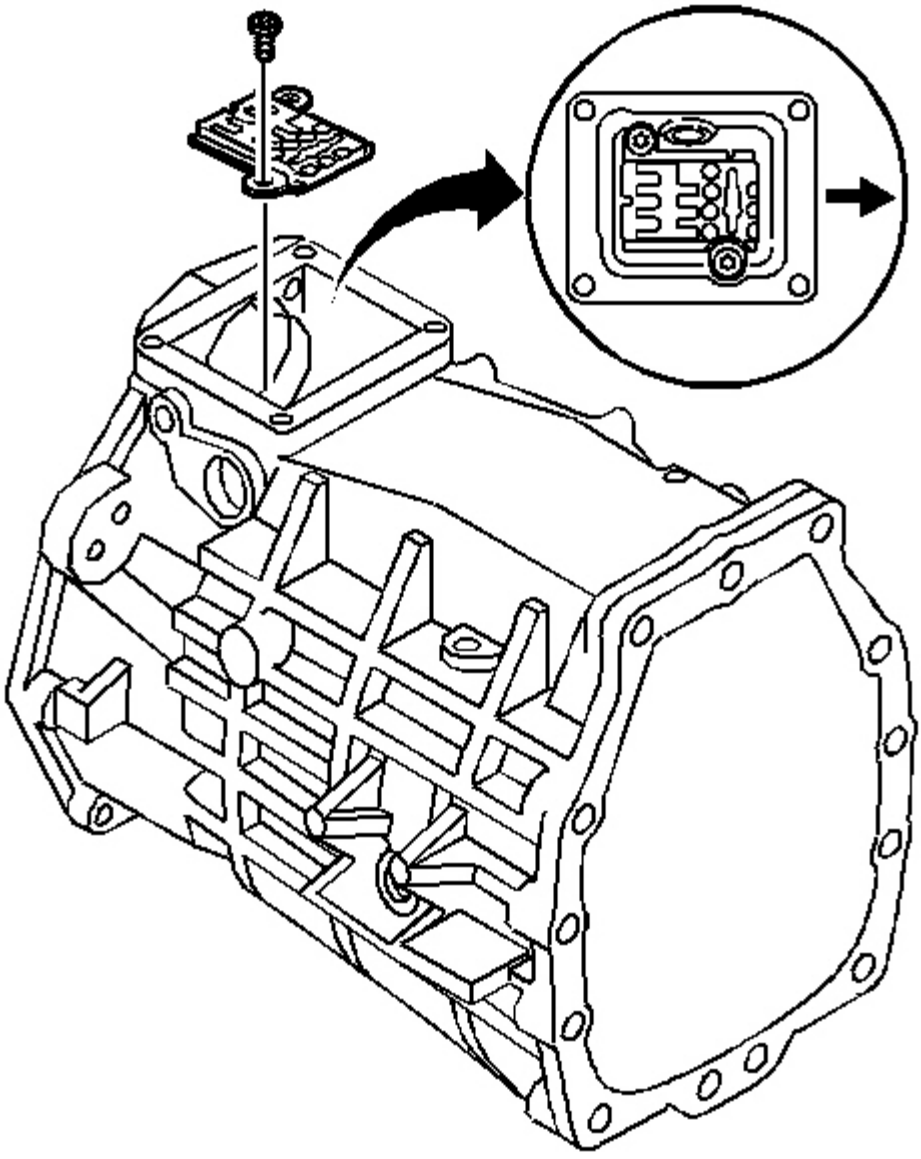


Fig. 309: View Of Guide Plate & Guide Plate Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: The H-pattern on the guide plate must face the extension housing. If the guide plate is installed incorrectly, then damage

will occur.

10. Install the guide plate and the guide plate bolts.

    Tighten: Tighten the bolts to 22 N.m (16 lb ft).

Adapter Plate

Tools Required

- **J 39433** Input Shaft Seal Installer. See **Special Tools**.
- **J 39439-1** Shift Rail Bushing Remover/lnstaller. See **Special Tools**.
- **J 42464** Shift Shaft Seal lnstaller. See **Special Tools**.
- **J 42496** Inner Shift Rail Inner Seal lnstaller. See **Special Tools**.

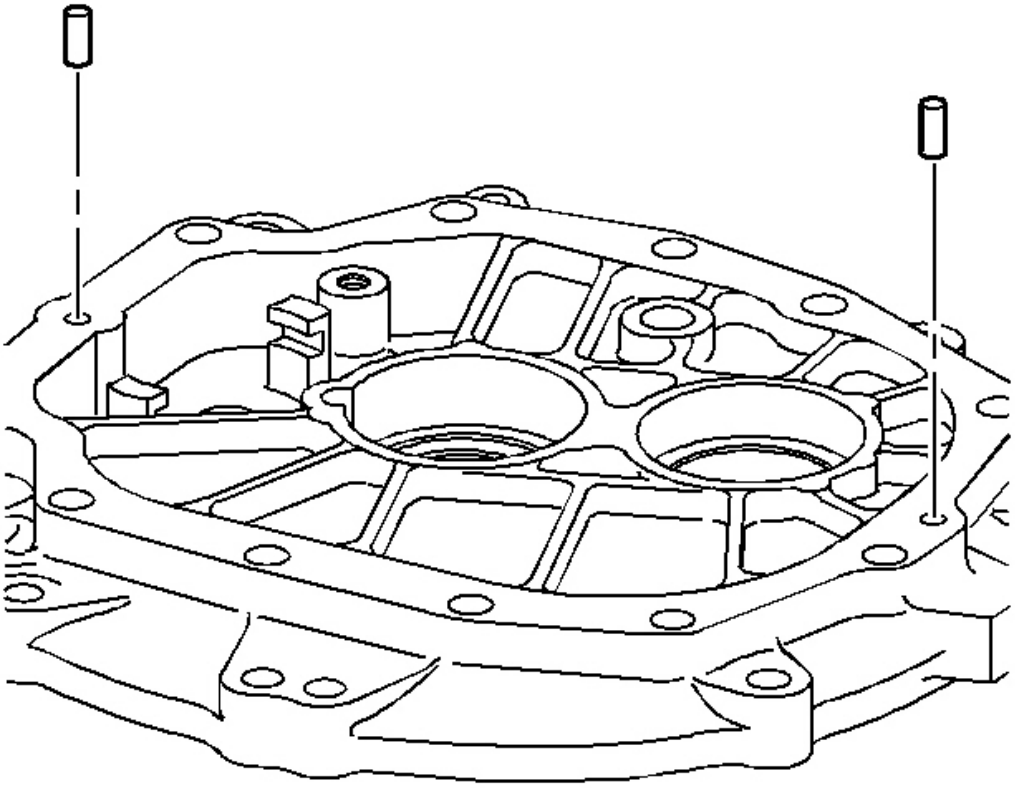


Fig. 310: View Of Transmission Dowel Pins
Courtesy of GENERAL MOTORS CORP.

1. Install the dowel pins.

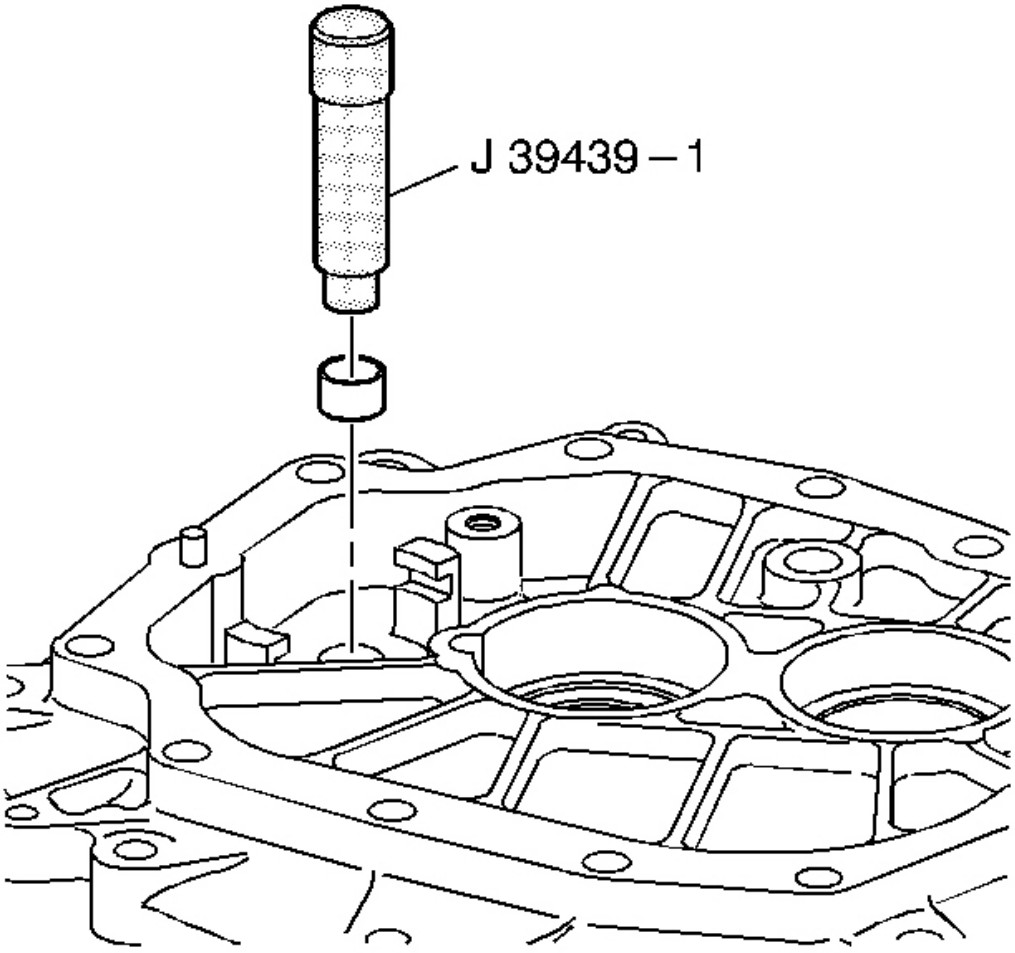


Fig. 311: Identifying 1st/2nd, 3rd/4th Speed Shift Shaft Bushing
Courtesy of GENERAL MOTORS CORP.

NOTE: If the 1st/2nd, 3rd/4th speed shift shaft bushing is installed incorrectly it will interfere with the inner shift rail seal causing a leak.

2. Install the 1st/2nd, 3rd/4th speed shift shaft bushing flush with adapter plate, using the **J 39439-1** . See **Special Tools**.

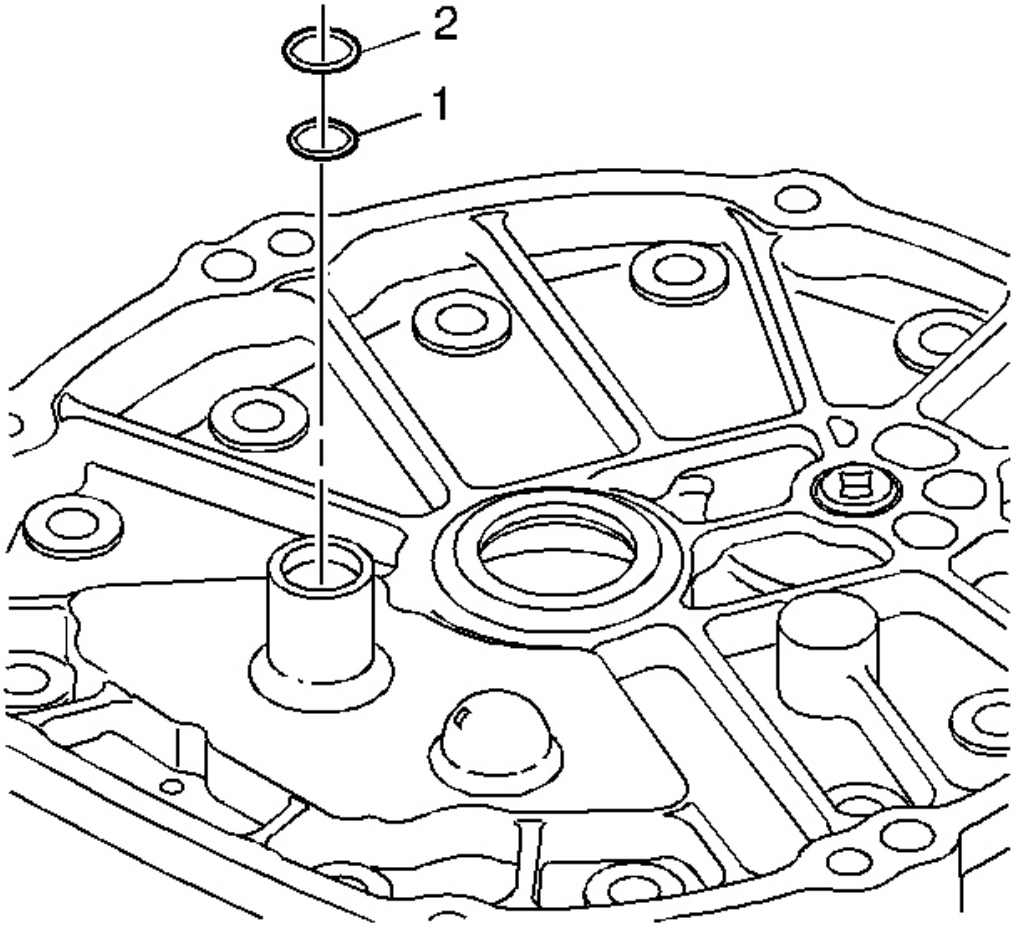


Fig. 312: View Of Shift Shaft Seals
Courtesy of GENERAL MOTORS CORP.

3. Install the inner shift rail seal (1) using the **J 42496** . See **Special Tools**. Garter spring should face inside of transmission.
4. Install the outer shift rail seal (2) using the **J 42464** . See **Special Tools**.

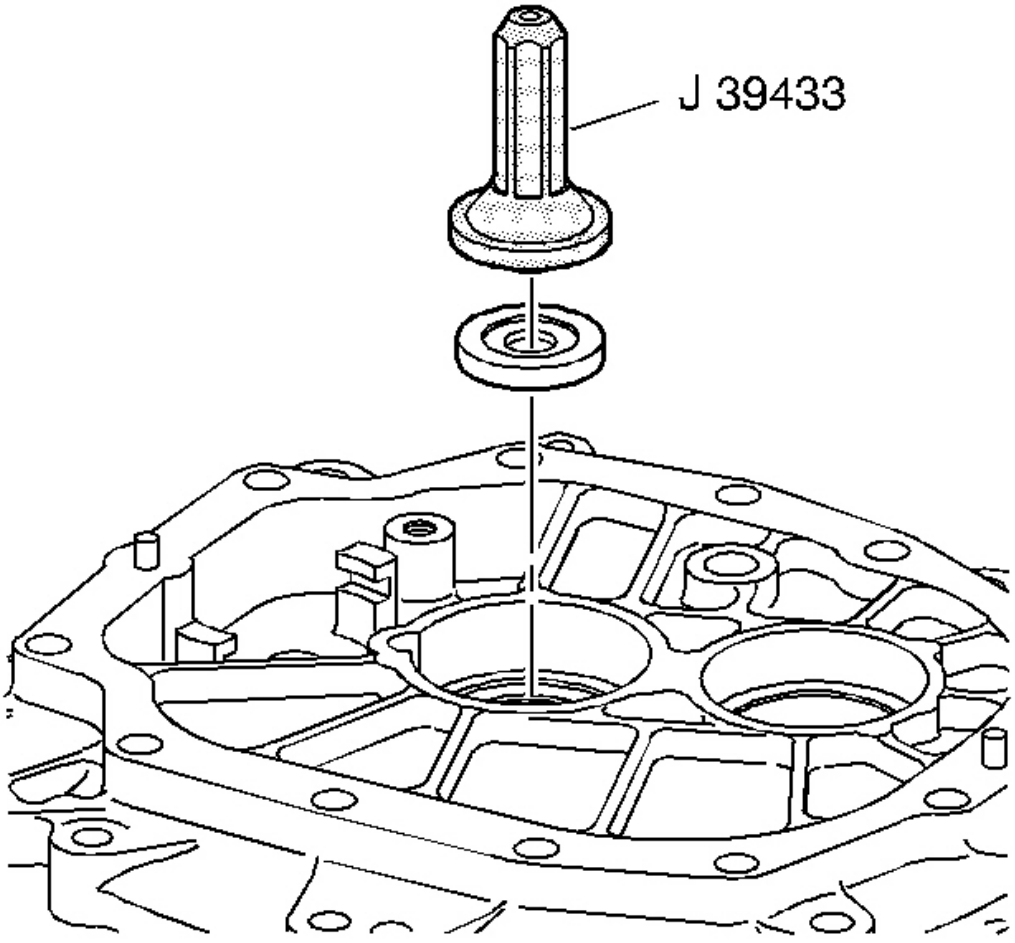


Fig. 313: View Of Input Shaft Seal Using J 39433
Courtesy of GENERAL MOTORS CORP.

5. Install the input shaft seal, using the **J 39433** . See **Special Tools**.

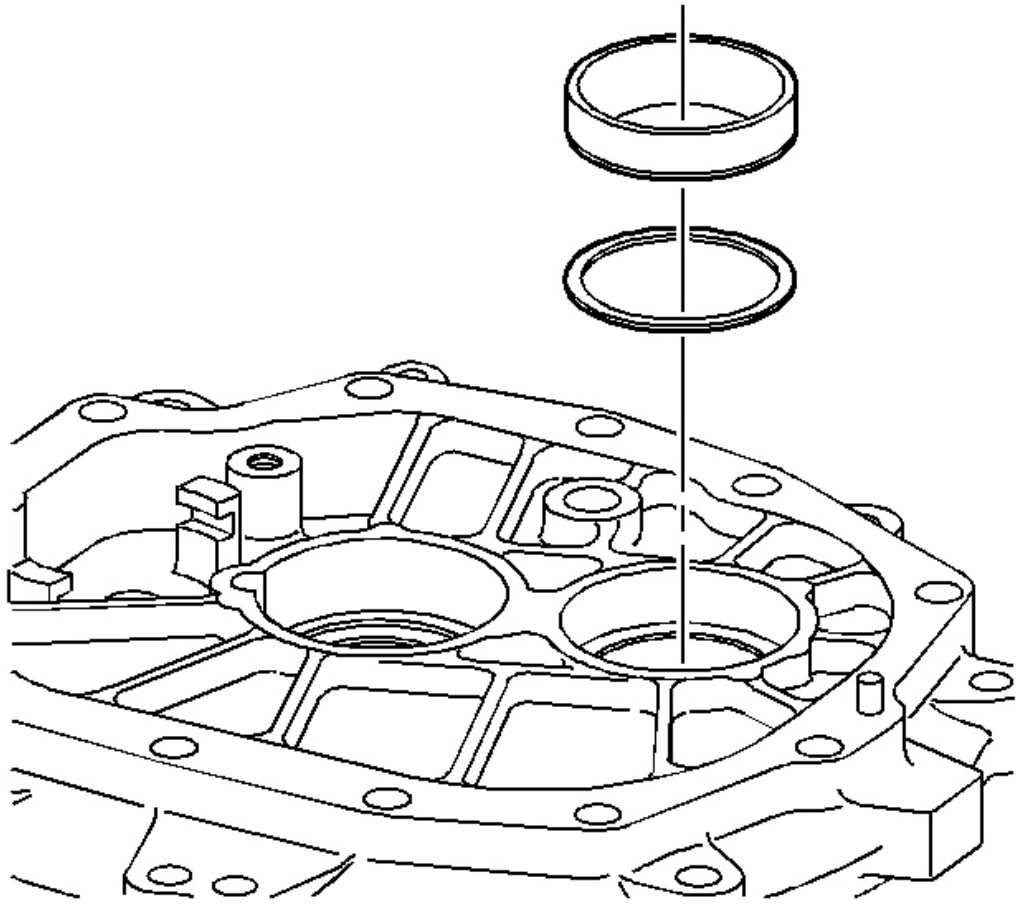


Fig. 314: Identifying Countershaft Bearing Shim & Bearing Race
Courtesy of GENERAL MOTORS CORP.

6. Install the countershaft bearing shim and bearing race. Refer to Input Shaft, Mainshaft and Countershaft in **Shimming Procedures**.

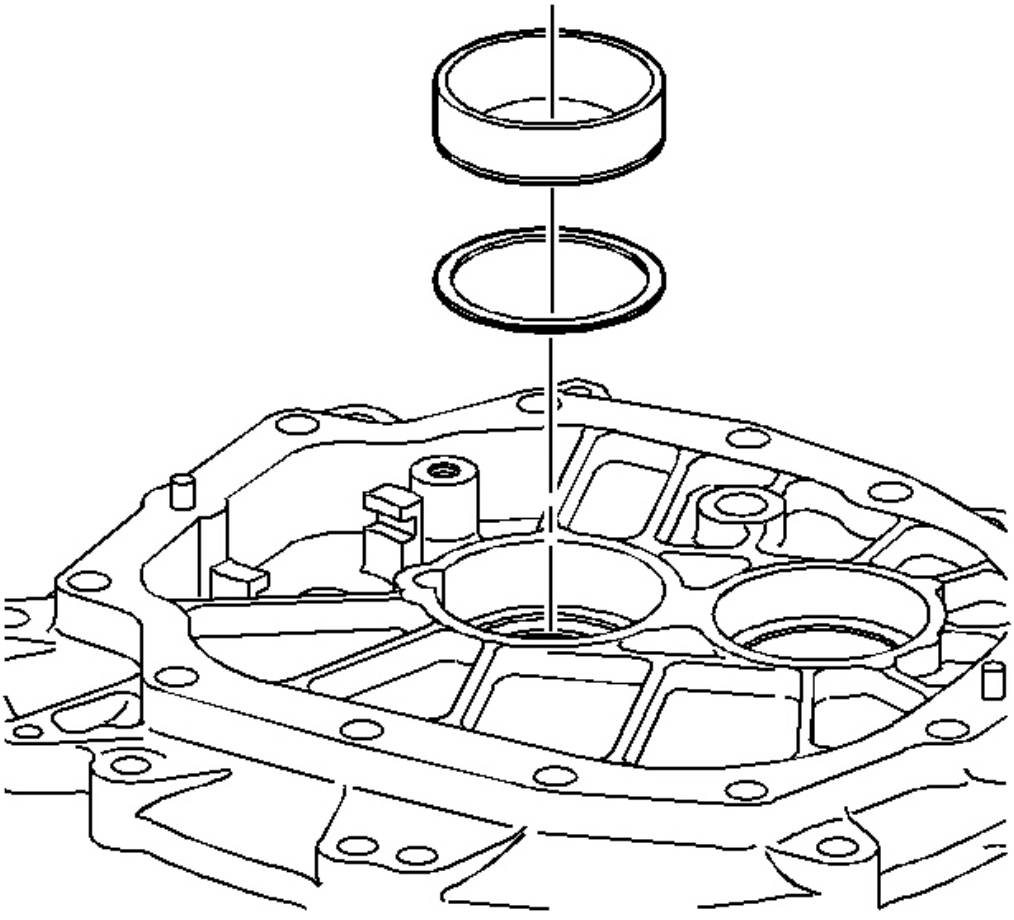


Fig. 315: View Of Input Shaft Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

7. Install the input shaft bearing shim and bearing race. Refer to Input Shaft, Mainshaft and Countershaft in **Shimming Procedures**.

EXTENSION HOUSING DISASSEMBLE

Tools Required

- **J 26941** Bearing Race Remover. See **Special Tools**.
- **J 23907** Slide Hammer. See **Special Tools**.

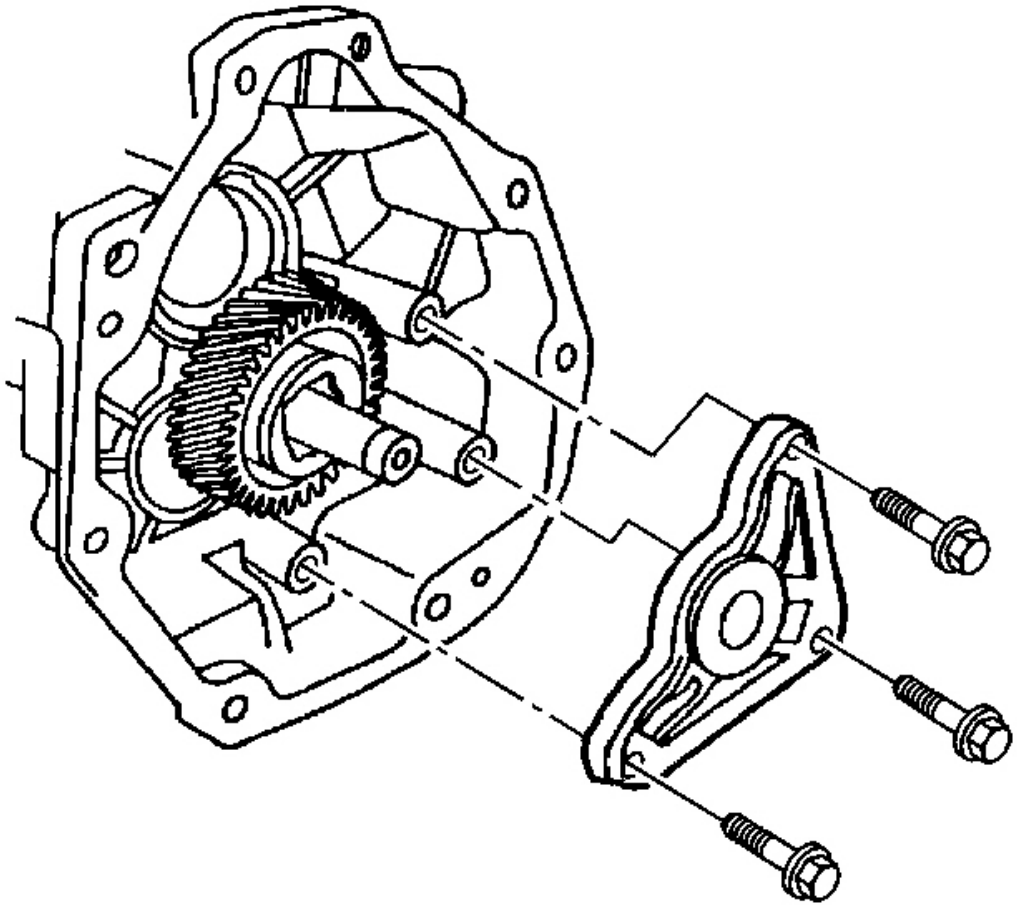


Fig. 316: View Of Reverse Idler Shaft Bracket & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the reverse idler shaft bracket bolts.

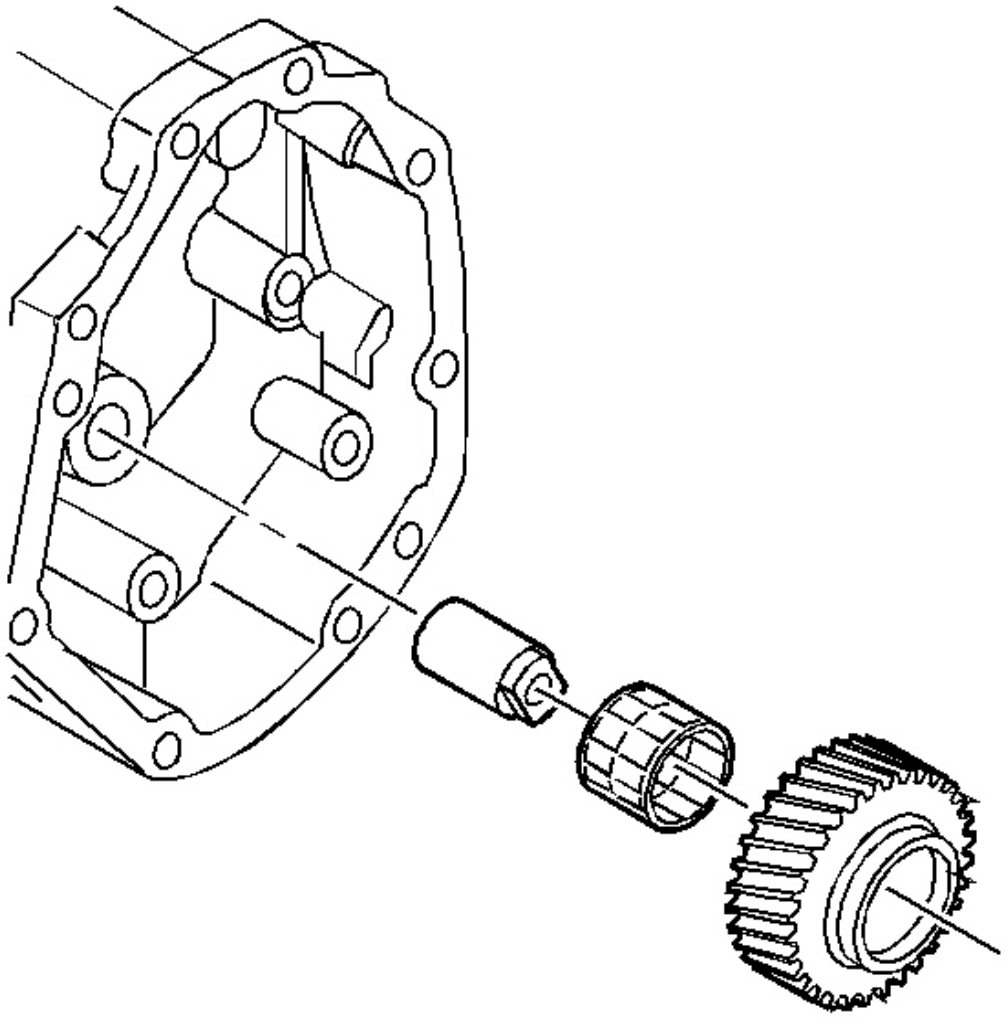


Fig. 317: Identifying Reverse Idler Shaft, Roller Bearing & Reverse Idler Gear
Courtesy of GENERAL MOTORS CORP.

2. Remove the reverse idler gear, the roller bearing, and the reverse idler shaft.

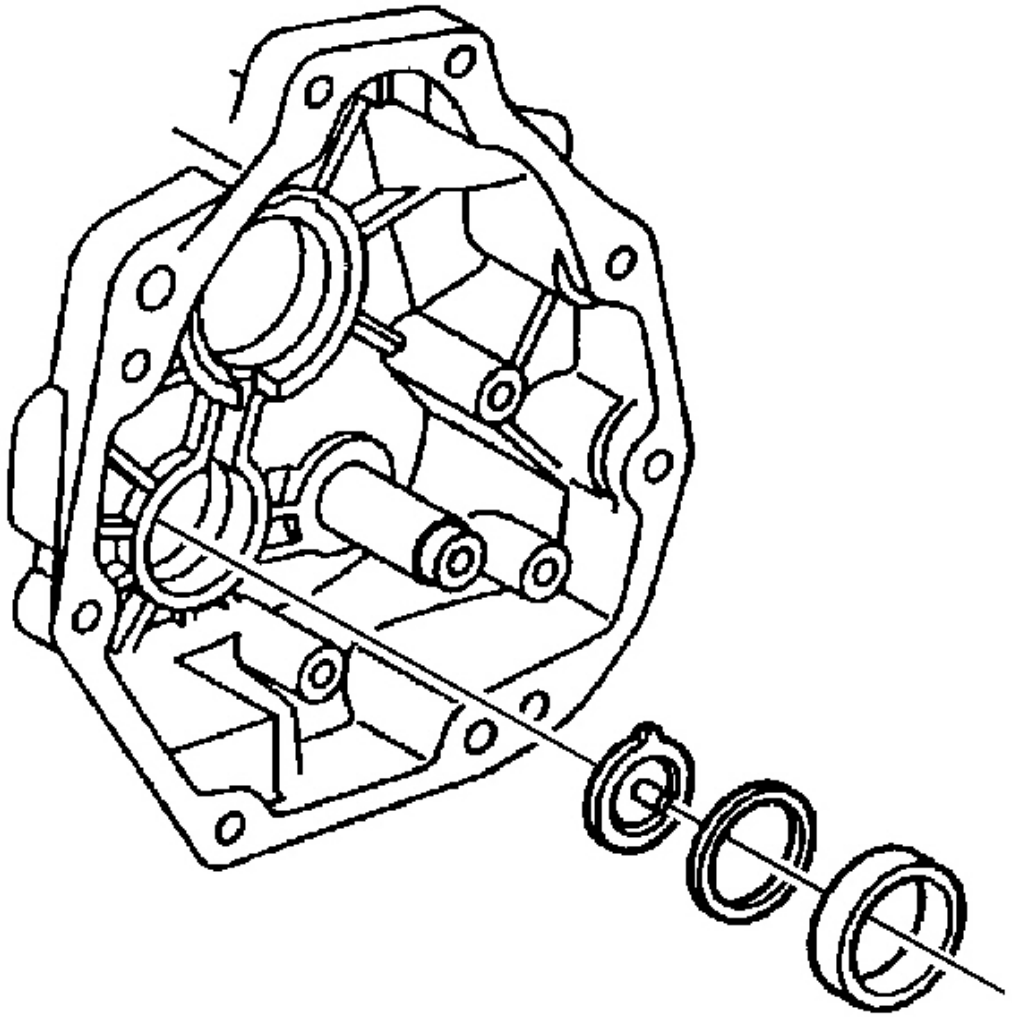


Fig. 318: View Of Countershaft Extension Bearing Race, Funnel & Shim
Courtesy of GENERAL MOTORS CORP.

3. Remove the countershaft extension bearing race, the shim, and the funnel.

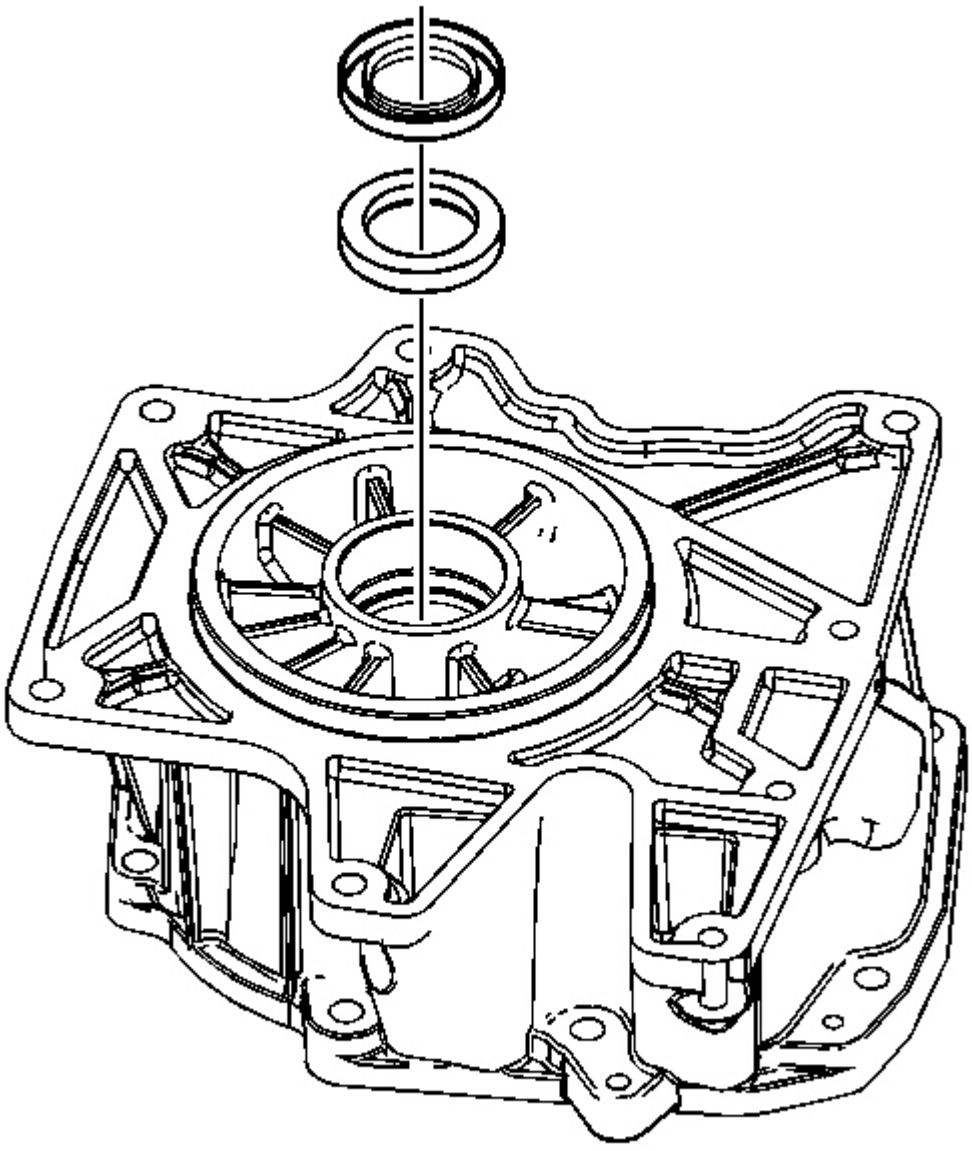


Fig. 319: View Of Output Shaft Outer And Inner Seals
Courtesy of GENERAL MOTORS CORP.

4. Remove the output shaft outer and inner seals.

   Pry out the seal with a suitable tool.

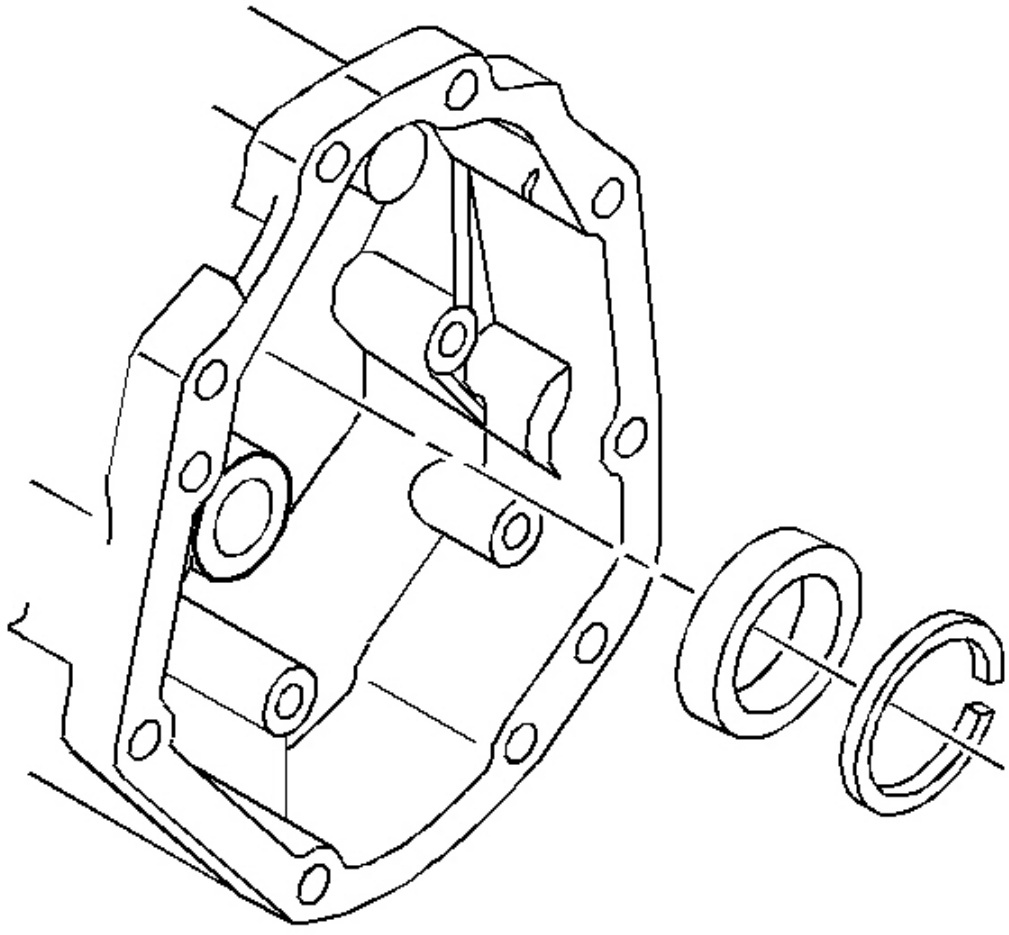


Fig. 320: Locating Mainshaft Bearing Race Retainer Ring & Race
Courtesy of GENERAL MOTORS CORP.

5. Remove the mainshaft bearing race retainer ring.

IMPORTANT: Do not replace the bearing race unless inspection shows bearing race damage.

6. Remove the mainshaft bearing race using **J 26941** and **J 23907** . See **Special Tools**.

EXTENSION HOUSING CLEANING AND INSPECTION

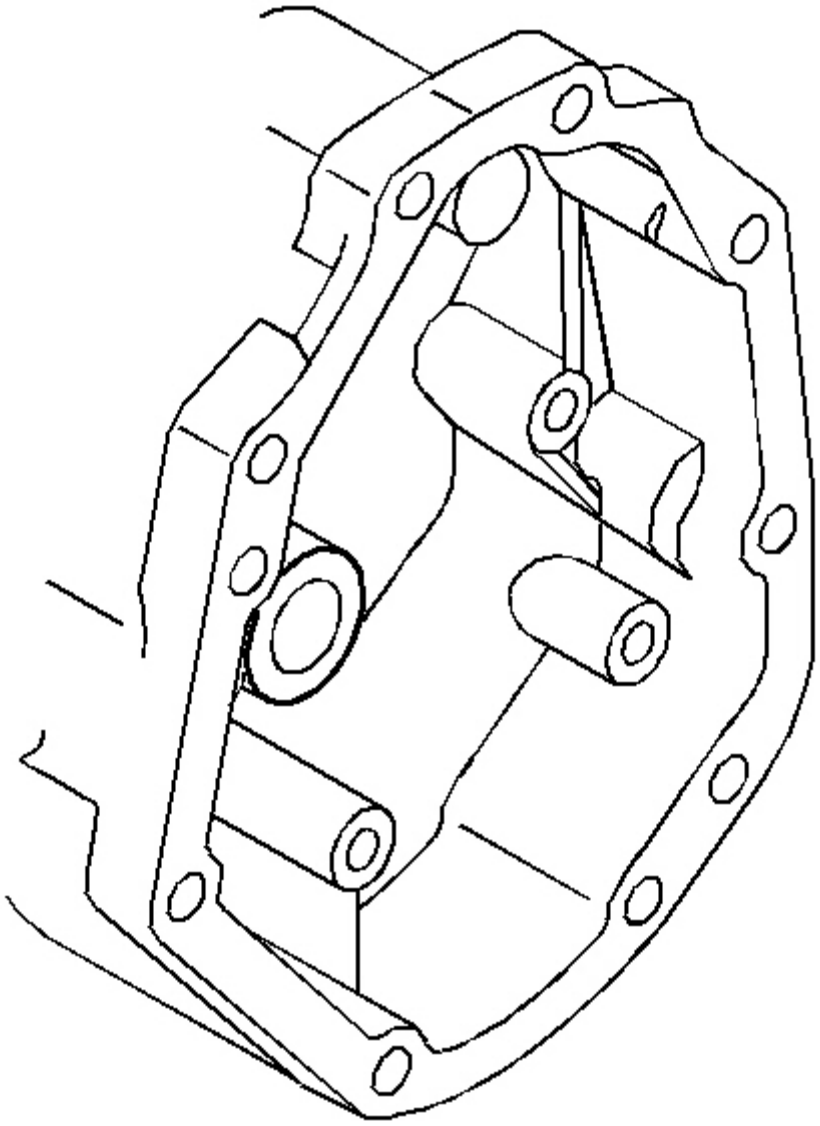


Fig. 321: View Of Rear Extension Housing
Courtesy of GENERAL MOTORS CORP.

1. Clean the rear extension housing in a suitable solvent. Air dry the housing.
2. Inspect the extension housing for the following:
   - Cracks

- Scratches
- Damaged threads
- Burrs
- Nicked mounting surfaces
- Damaged sealing surfaces
- Damaged front or rear bearing bores

3. Replace a cracked housing.
4. Clean up damaged threads with the correct size thread tap.
5. Inspect the machined mating surfaces for flatness (Check the mating surfaces with a straight edge).
6. Use a fine mill file to dress minor scratches or burrs.

EXTENSION HOUSING ASSEMBLE

Tools Required

- **J 8092** Drive Handle
- **J 21426** Outer Output Shaft Seal Installer
- **J 39546** Bearing Race Installer. See **Special Tools**.
- **J 39437** Bushing Installer. See **Special Tools**.

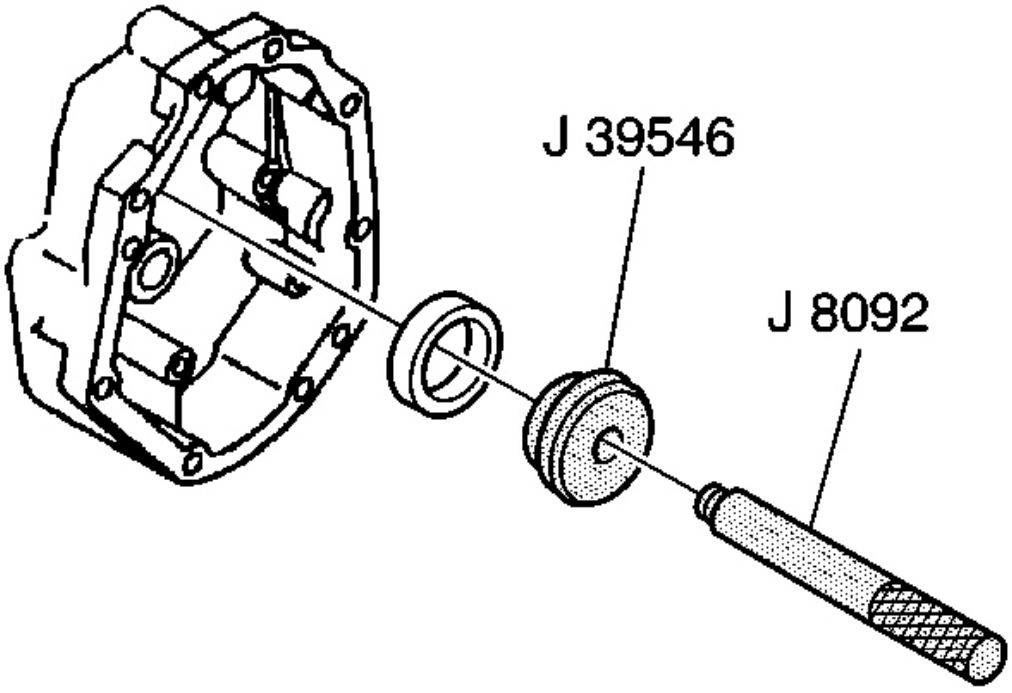


Fig. 322: View Of Mainshaft Bearing Race & Special Tools
Courtesy of GENERAL MOTORS CORP.

1. Install the mainshaft bearing race, using the **J 39546** and the **J 8092** . See **Special Tools**.

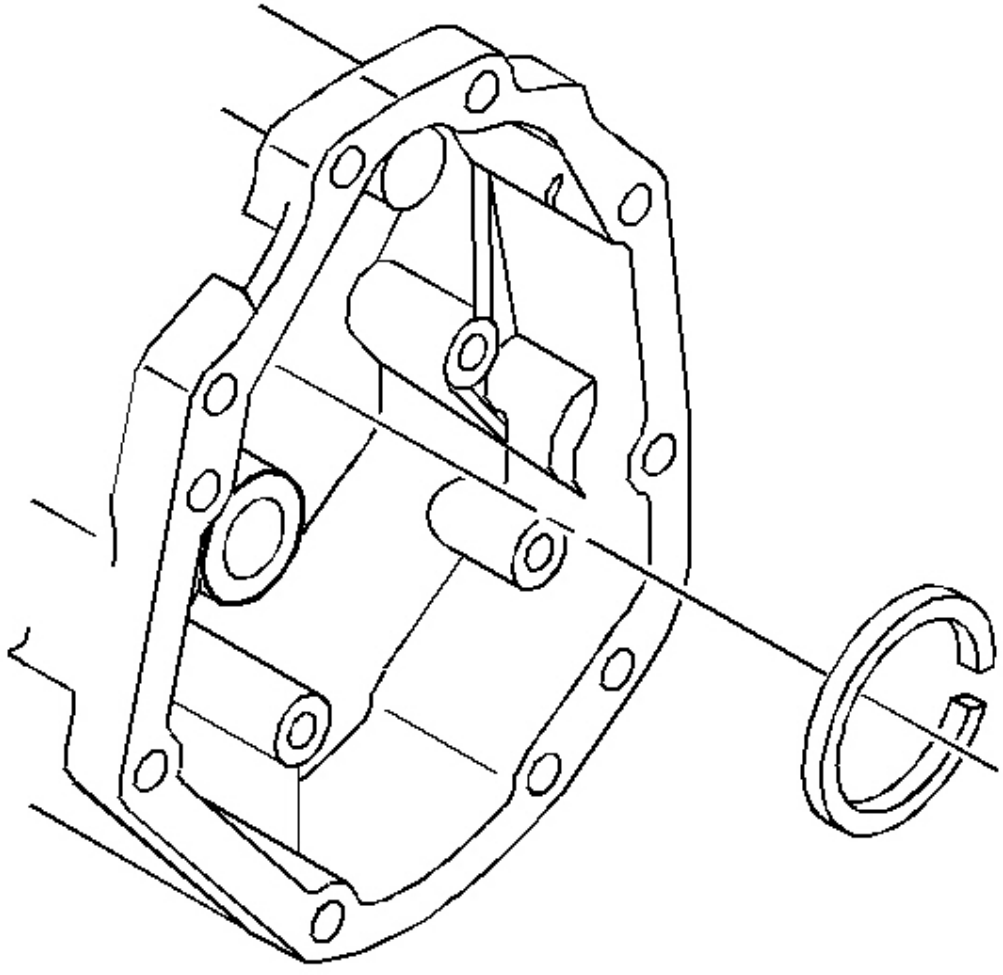


Fig. 323: Locating Mainshaft Bearing Race Retainer Ring
Courtesy of GENERAL MOTORS CORP.

2. Install the mainshaft bearing race retainer ring.

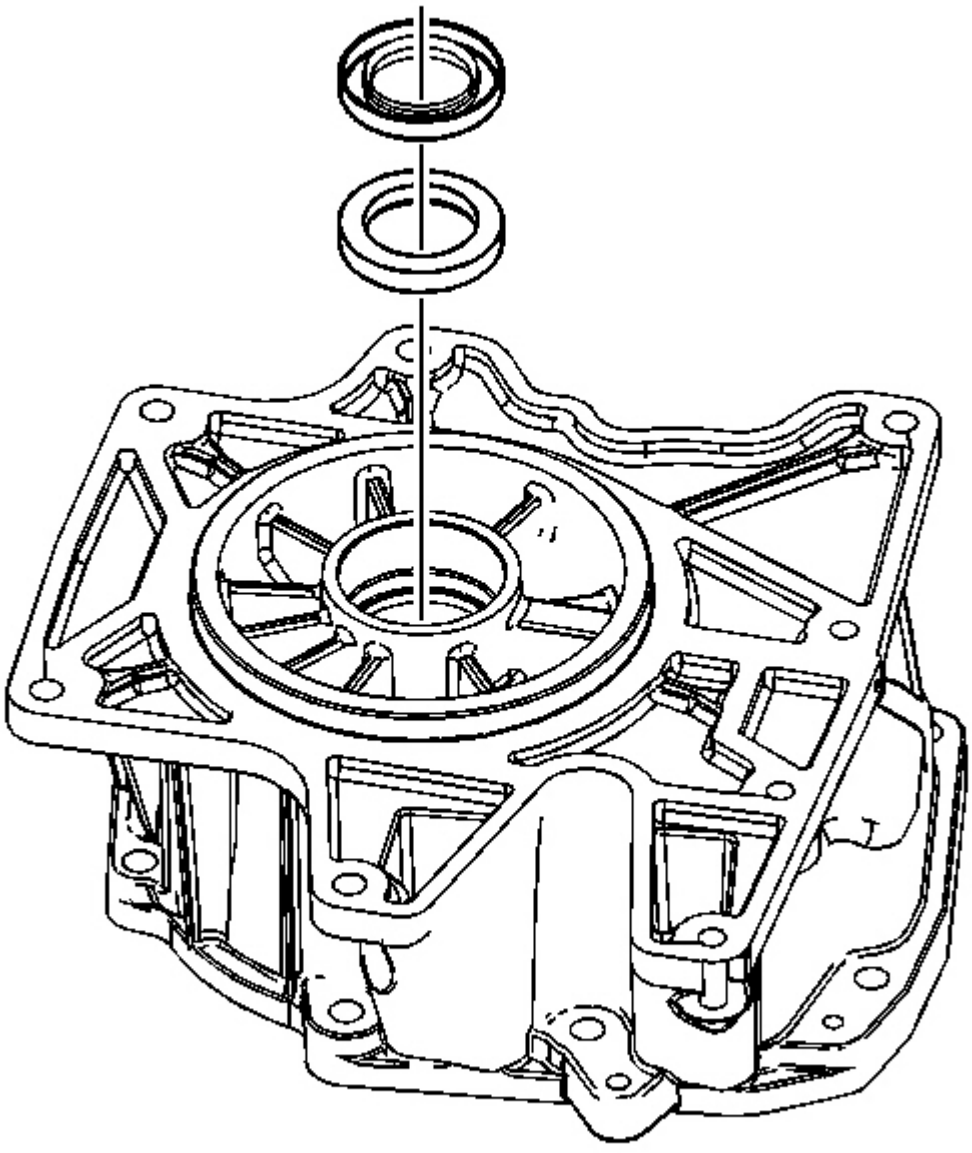


Fig. 324: View Of Output Shaft Inner And Outer Seals
Courtesy of GENERAL MOTORS CORP.

3. Install the output shaft inner and outer seals using the **J 21426** .

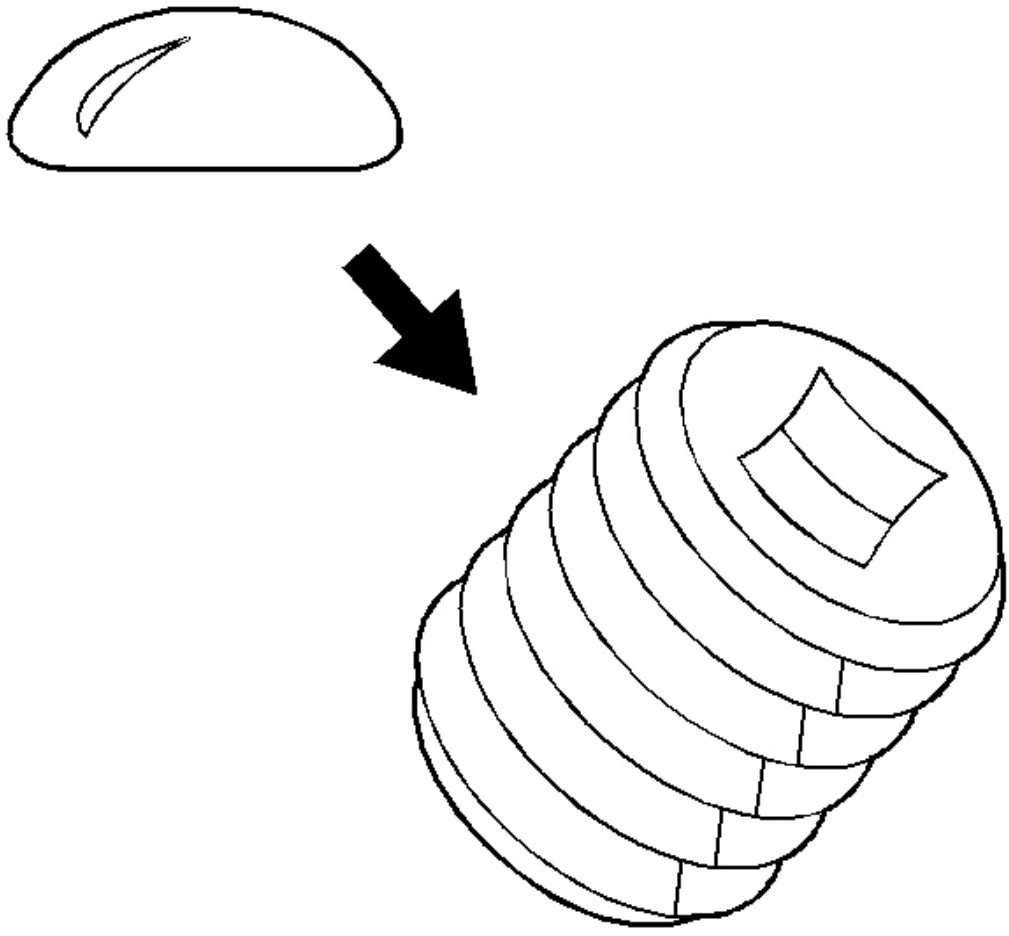


Fig. 325: Applying Sealant To Adapter Plate Plug Threads
Courtesy of GENERAL MOTORS CORP.

4. Apply sealer GM P/N 12346004 (Canadian P/N 10953480) or equivalent to the transmission case drain plug.

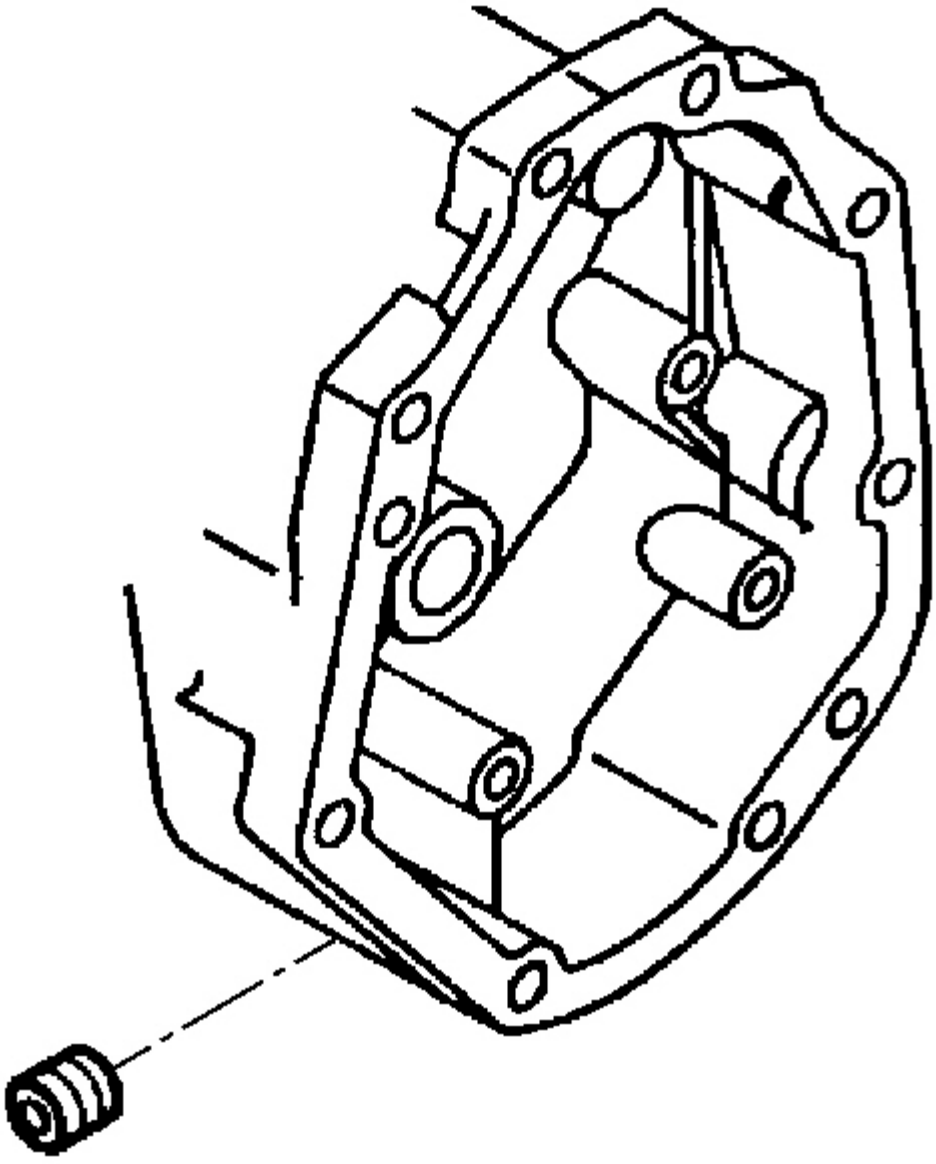


Fig. 326: Identifying Transmission Case Drain Plug
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the transmission case drain plug.

   Tighten: Tighten the plug to 18 N.m (13 Ib ft).

BEARINGS AND SPACERS CLEANING AND INSPECTION

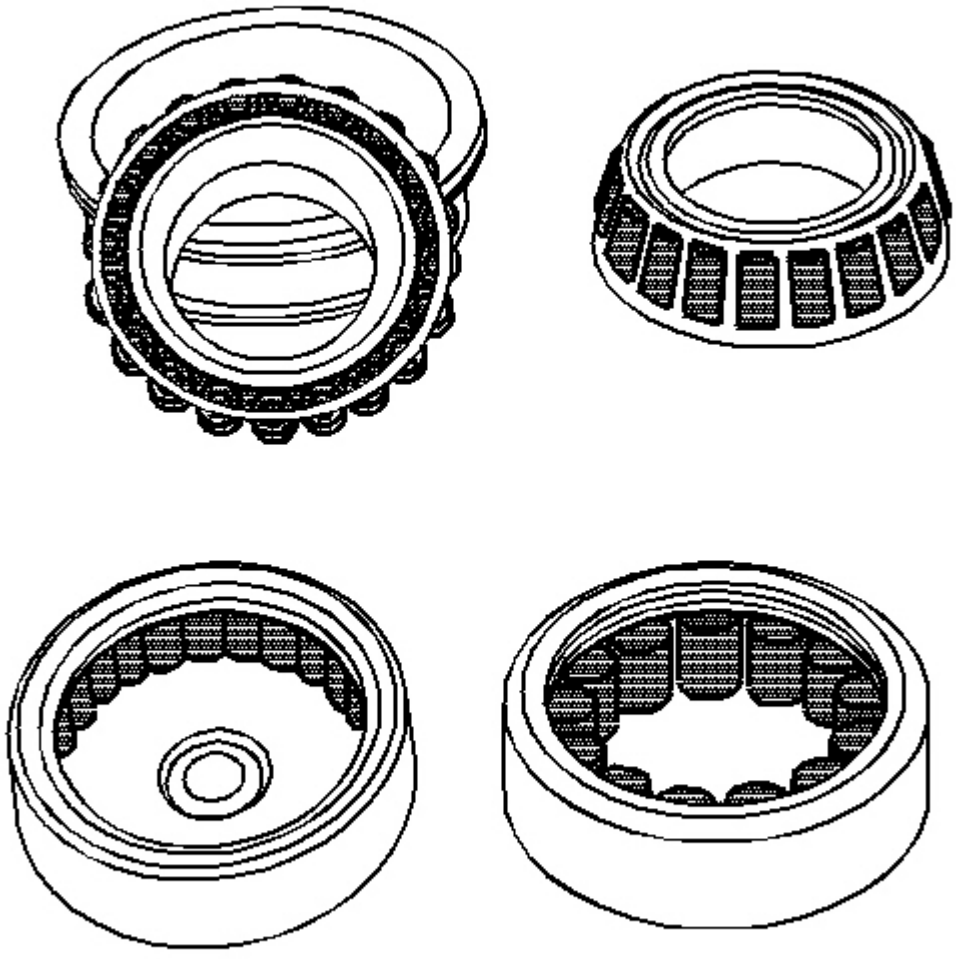


Fig. 327: View of Bearings & Spacers
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not allow the bearings to spin. Turn them slowly by hand.

Spinning the bearings may damage the race and the rollers.

1. Clean all the bearing parts in a suitable solvent. Air dry all the parts.
2. Lubricate the bearings. Refer to **Lubrication Specifications** for the proper transmission lubricant.
3. Inspect the bearings and journals for roughness and unusual wear or damage.
4. Inspect the mainshaft bearing journals for wear.
5. Inspect the mainshaft speed gear bearings for wear.
6. Inspect the main drive gear pilot bearing rollers for wear.
7. Replace parts which show signs of excessive wear.
8. Do not file surfaces which have been hardened and precision ground.
9. Replace worn or damaged bearings.
10. Replace mated bearing parts when only one part is damaged.

GEARS CLEANING AND INSPECTION

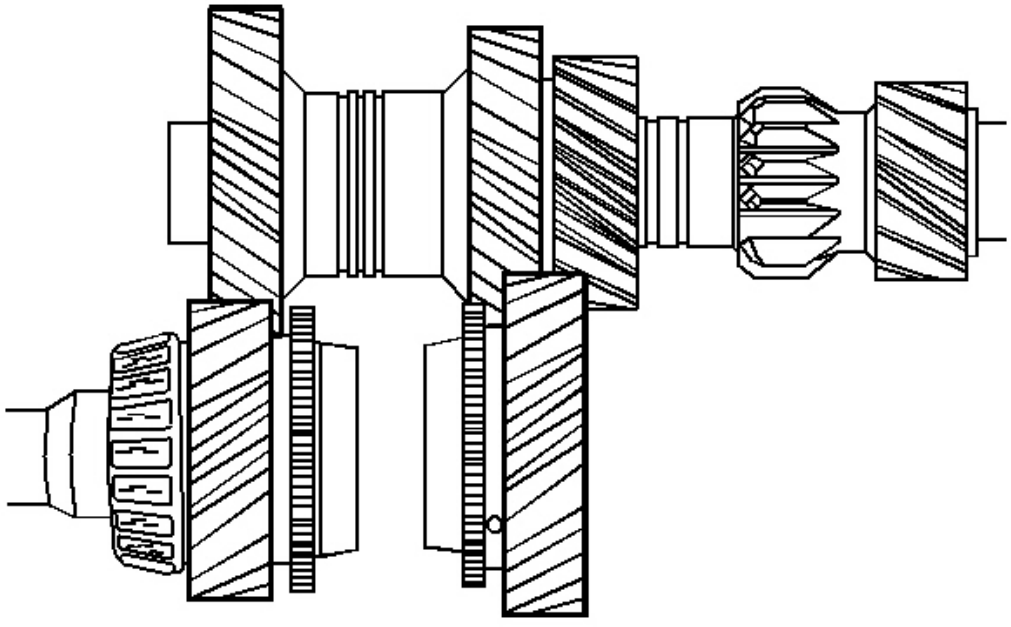


Fig. 328: View Of Gears

Courtesy of GENERAL MOTORS CORP.

1. Clean all the parts in a suitable solvent. Air dry all the parts.
2. Inspect the gear tooth surfaces on all the gear sets for the following conditions:
   - Cracks
   - Pitting
   - Nicks
   - Chipped gear teeth
   - High spots (Small-shiny spots on the gear teeth mating surface) that could cause gear noise
3. Inspect for damaged splines on the input shaft, mainshaft, and the countershaft extension.
4. Remove nicks and burrs with a soft stone or a crocus cloth.
5. Replace a burred or nicked part that cannot be reconditioned by hand.
6. Replace gears and gear assemblies that are worn or damaged.

COUNTER GEAR SHAFT ASSEMBLE (Z06 AND SSR)

Tools Required

- **J 5590** Press Tube
- **J 39441-10** 5th Gear Installer Adapter. See **Special Tools**.

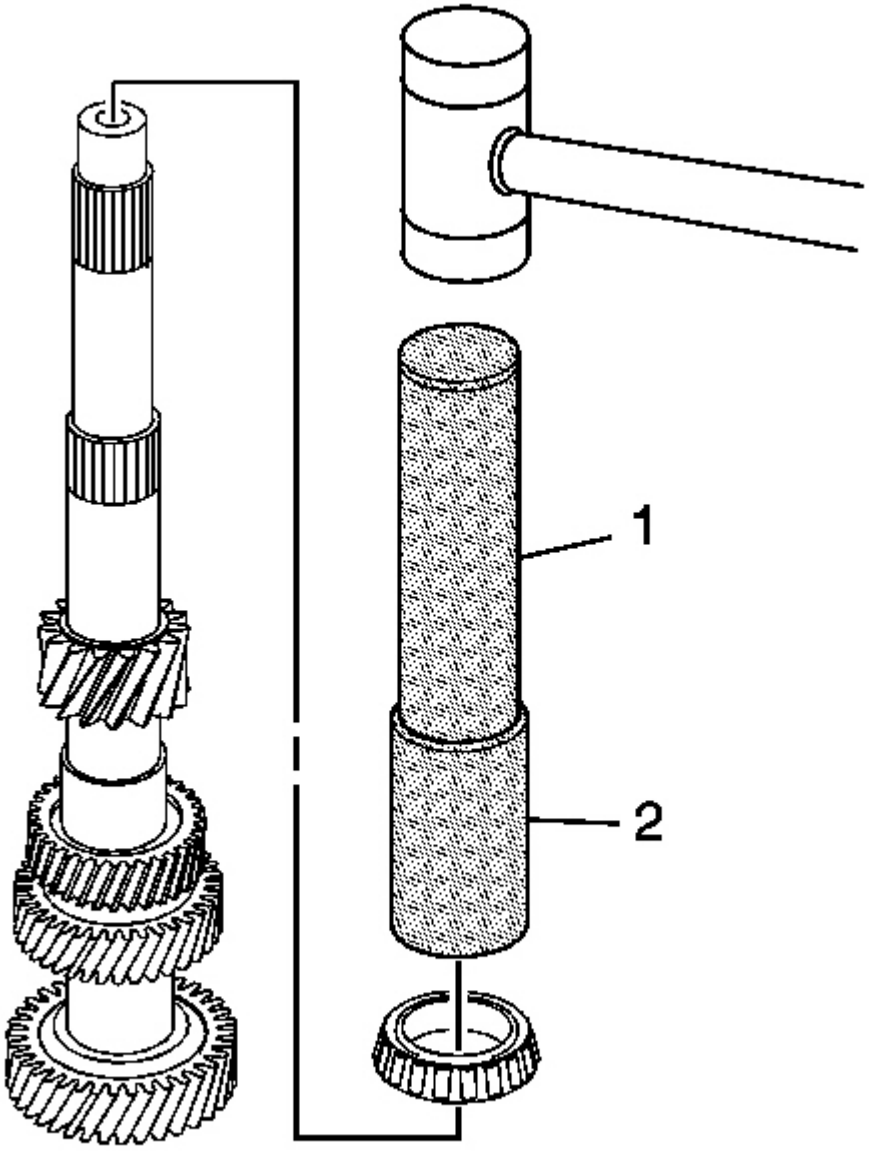


Fig. 329: View Of Tapered Bearing & Special Tools
Courtesy of GENERAL MOTORS CORP.

1. Install a new large tapered bearing, using the **J 5590** (1),**J 39441-10** (2) and a rubber mallet. See **Special Tools**.

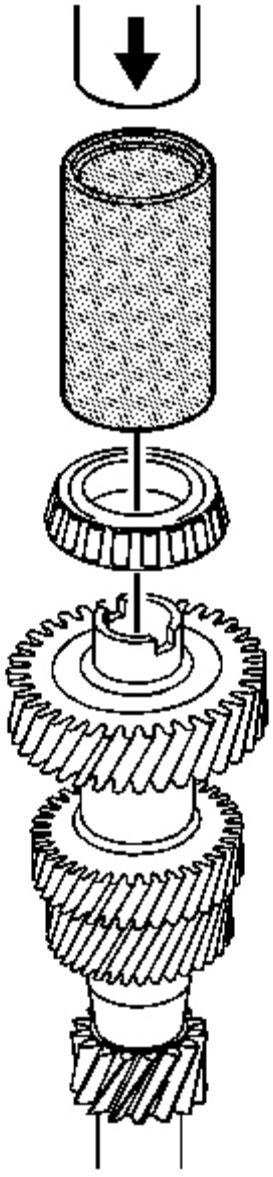


Fig. 330: View Of Small Tapered Bearing & Special Tool
Courtesy of GENERAL MOTORS CORP.

2. Install a new small tapered bearing, using the **J 5590** and a hydraulic press.

MAIN SHAFT AND INPUT SHAFT ASSEMBLE

Mainshaft

Tools Required

- **J 36183** Press Tube. See **Special Tools**.
- **J 36184** Press Tube Adapter. See **Special Tools**.
- **J 39371** 1st/2nd Synchronizer Installer. See **Special Tools**.
- **J 39473** Mainshaft Bearing Installer. See **Special Tools**.

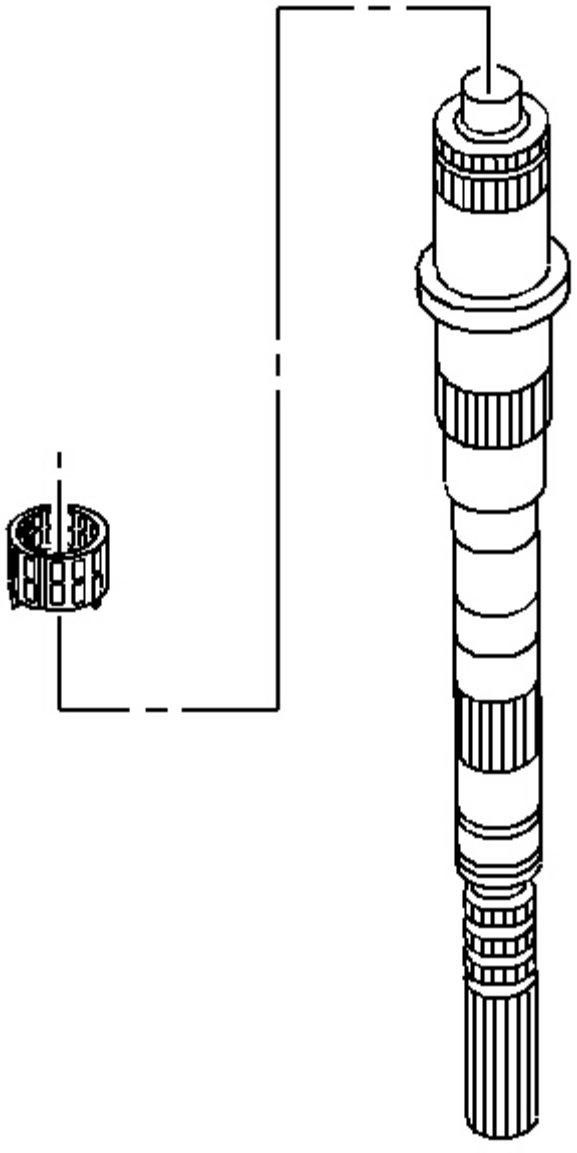


Fig. 331: View Of 3rd Speed Gear Caged Needle Bearing & Spacer
Courtesy of GENERAL MOTORS CORP.

1. Install the 3rd speed gear caged needle bearing and the spacer.

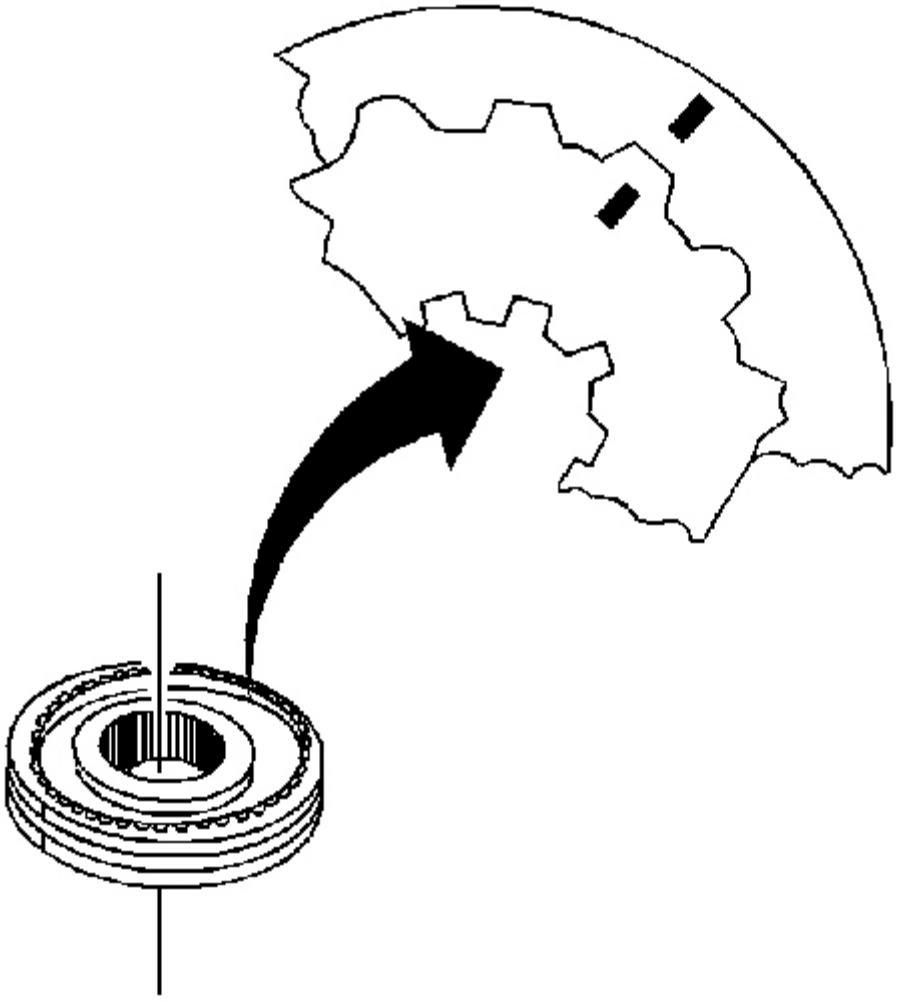


Fig. 332: View Of Alignment Marks On Synchronizer Hub & Synchronizer Sleeve
Courtesy of GENERAL MOTORS CORP.

2. Check the 3rd/4th speed gear synchronizer assembly scribe marks for correct positions.

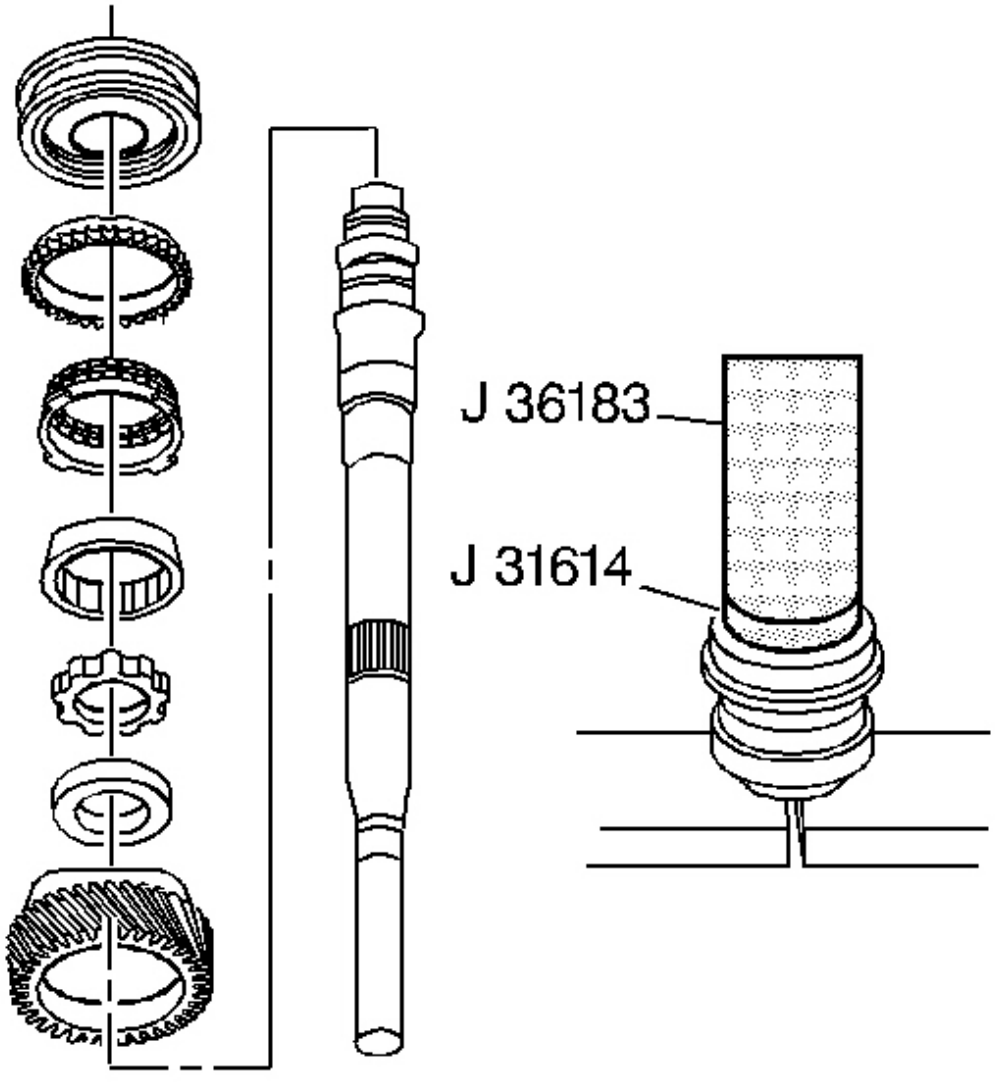


Fig. 333: View Of 3rd/4th Synchronizer Assembly
Courtesy of GENERAL MOTORS CORP.

3. Install the 3rd/4th synchronizer assembly as follows:
    1. Start the press operation.
    2. STOP pressing before the keys engage the blocking ring slots.
    3. Lift and rotate the 3rd speed gear in order to engage the keys with the blocking ring.

4. Continue pressing until the synchronizer is seated.

4. Install the following parts in order, using the **J 36183** , the **J 36184** , and a hydraulic press:. See **Special Tools**.
   1. The 3rd speed gear
   2. The spacer
   3. The thrust washer
   4. The 3rd speed gear inner cone
   5. The 3rd speed gear friction cone
   6. The 3rd speed gear blocking ring
   7. The 3rd/4th speed gear synchronizer assembly (the groove on the sleeve faces the 3rd speed gear).

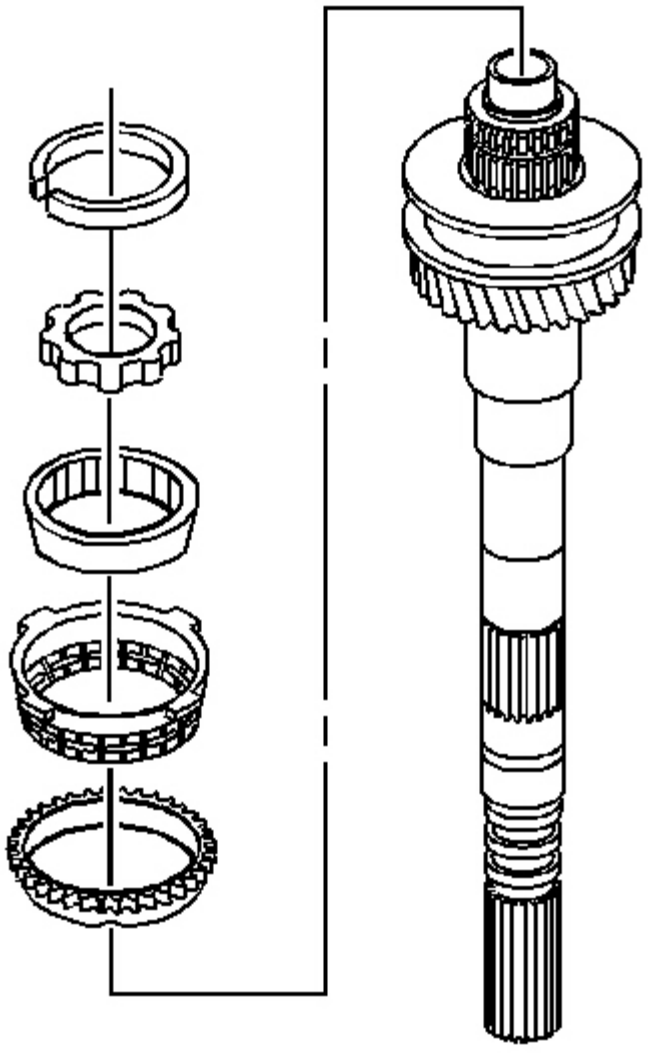


Fig. 334: Exploded View Of 4th Gear Assembly
Courtesy of GENERAL MOTORS CORP.

5. Install in the following order:
    1. 4th gear blocking ring
    2. 4th gear friction cone
    3. 4th gear inner cone

4. 4th gear thrust washer
5. 3rd/4th synchronizer retainer ring

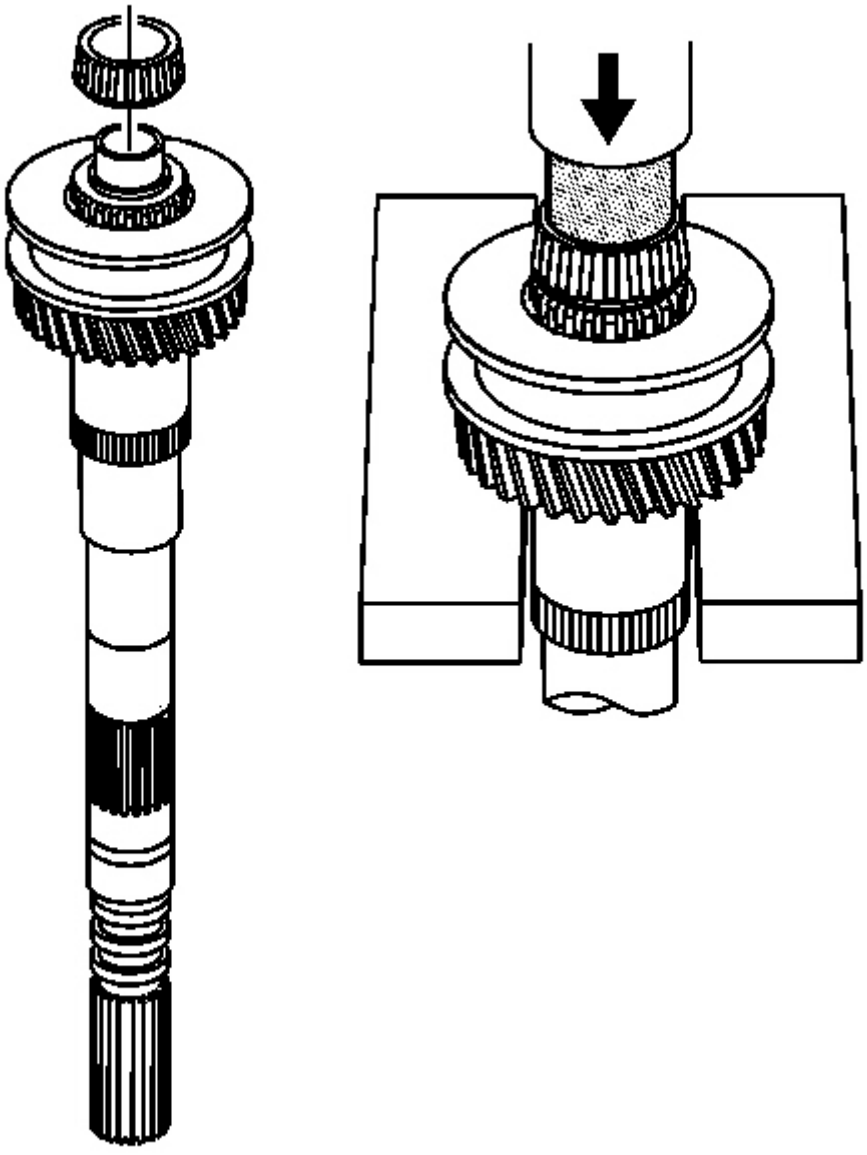


Fig. 335: View Of Mainshaft Small Tapered Bearing
Courtesy of GENERAL MOTORS CORP.

6. Install a new mainshaft small tapered bearing, using the **J 39473** , V-blocks, and a hydraulic press. See **Special Tools**.

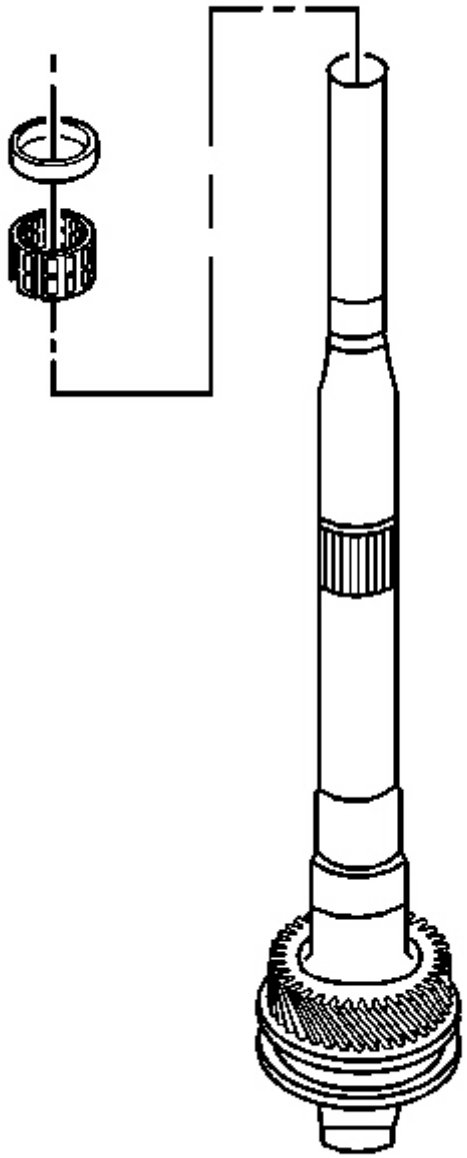


Fig. 336: View Of 2nd Speed Gear Caged Needle Bearing & Bearing Spacer
Courtesy of GENERAL MOTORS CORP.

7. Install the 2nd speed gear caged needle bearing and bearing spacer.

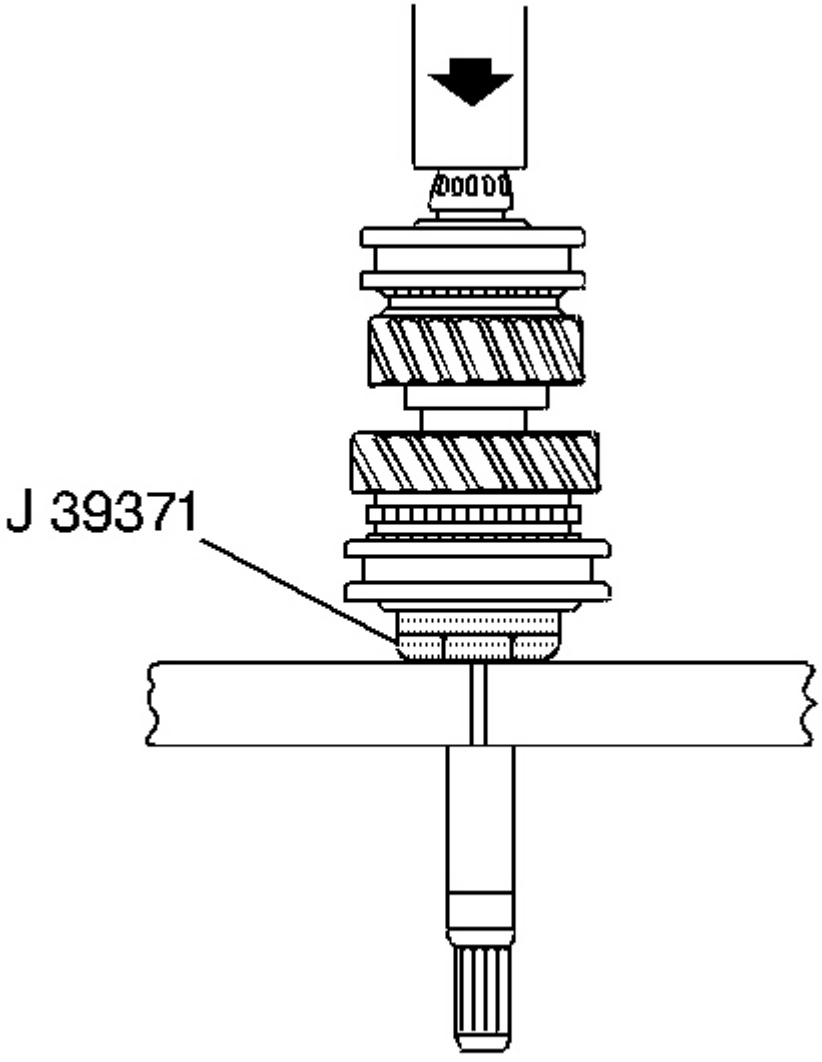


Fig. 337: Identifying J 39371
Courtesy of GENERAL MOTORS CORP.

8. Do the following when installing the 1st/2nd synchronizer assembly:
    1. Start the press operation.

2. Stop pressing before the keys engage the blocking ring slots.
3. Lift and rotate the 2nd speed gear in order to engage the keys with the blocking ring.
4. Continue pressing until the synchronizer is seated.

9. Install the following parts in order using the **J 39371** and a hydraulic press:. See **Special Tools**.
   1. The 2nd speed gear
   2. The 2nd speed gear inner cone
   3. The 2nd speed gear friction cone
   4. The 2nd speed gear blocking ring
   5. The 1st/2nd synchronizer assembly (The ID groove on the sleeve faces the 1st speed gear.)

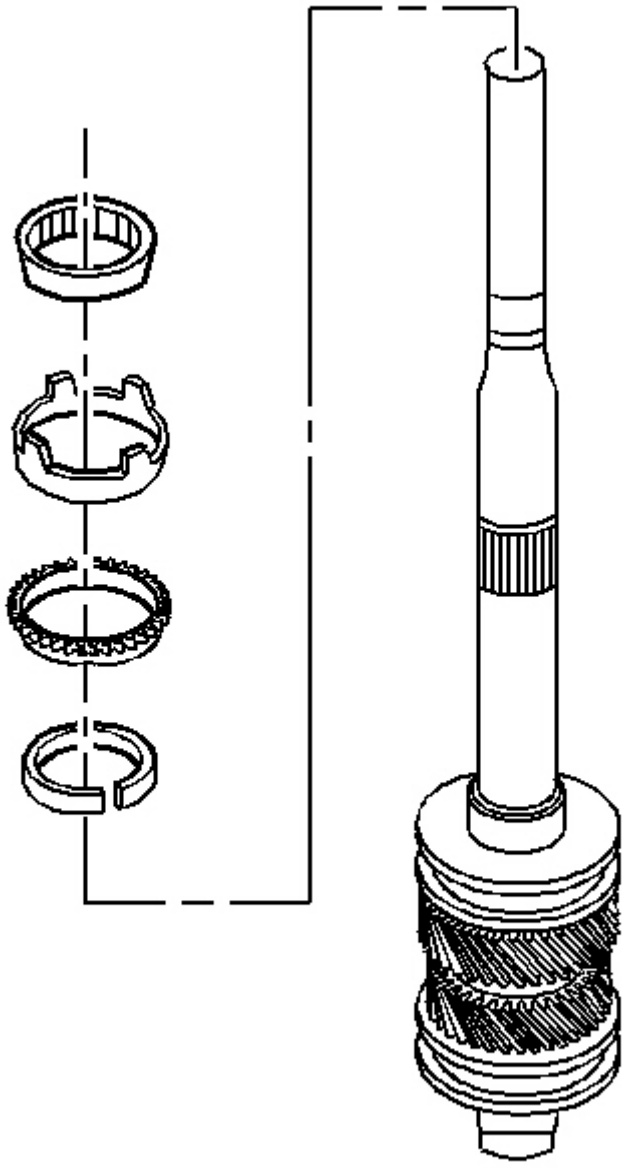


Fig. 338: View Of 1st Speed Gear Cones & Rings
Courtesy of GENERAL MOTORS CORP.

10. Install the following parts in order:
    1. The retainer ring

2. The blocking ring
3. The friction cone
4. The inner cone

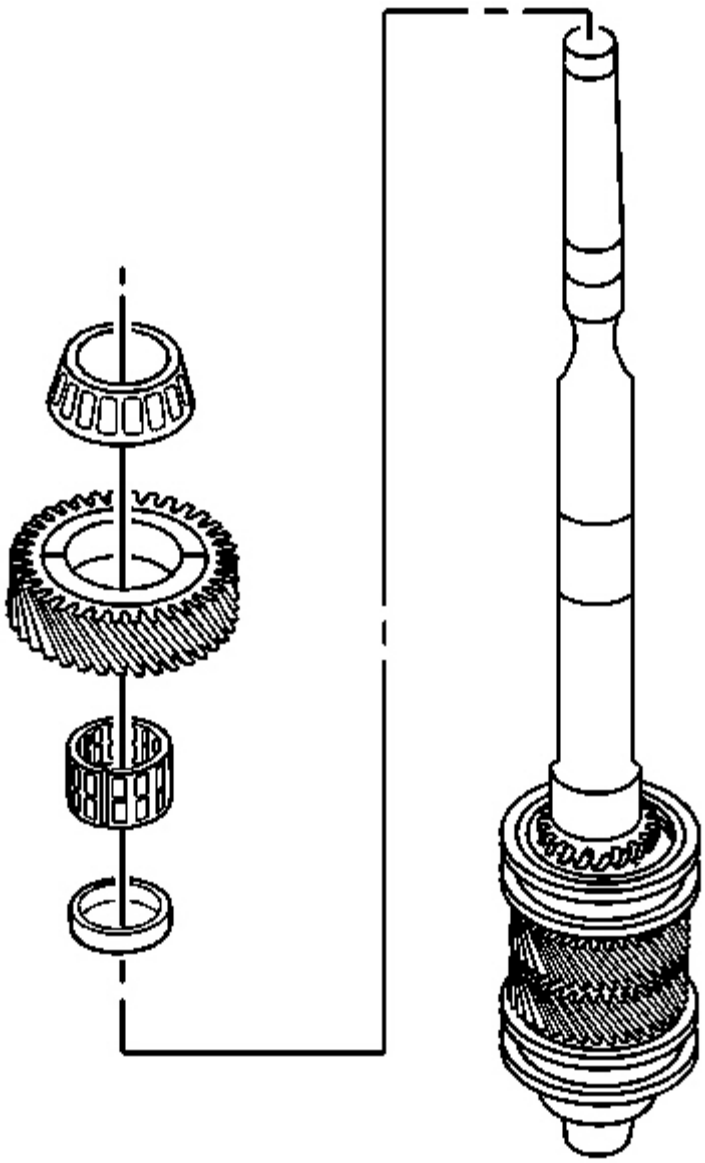


Fig. 339: View Of 1st Speed Gear Components

Courtesy of GENERAL MOTORS CORP.

11. Install the following parts in order:
    1. The 1st speed gear bearing spacer
    2. The 1st speed gear caged needle bearing
    3. The 1st speed gear
    4. The mainshaft large tapered bearing and the O-ring seal

Input Shaft

Tools Required

- **J 28537-17** Bearing Race Installer. See **Special Tools**.
- **J 25234** Press Tube. See **Special Tools**.

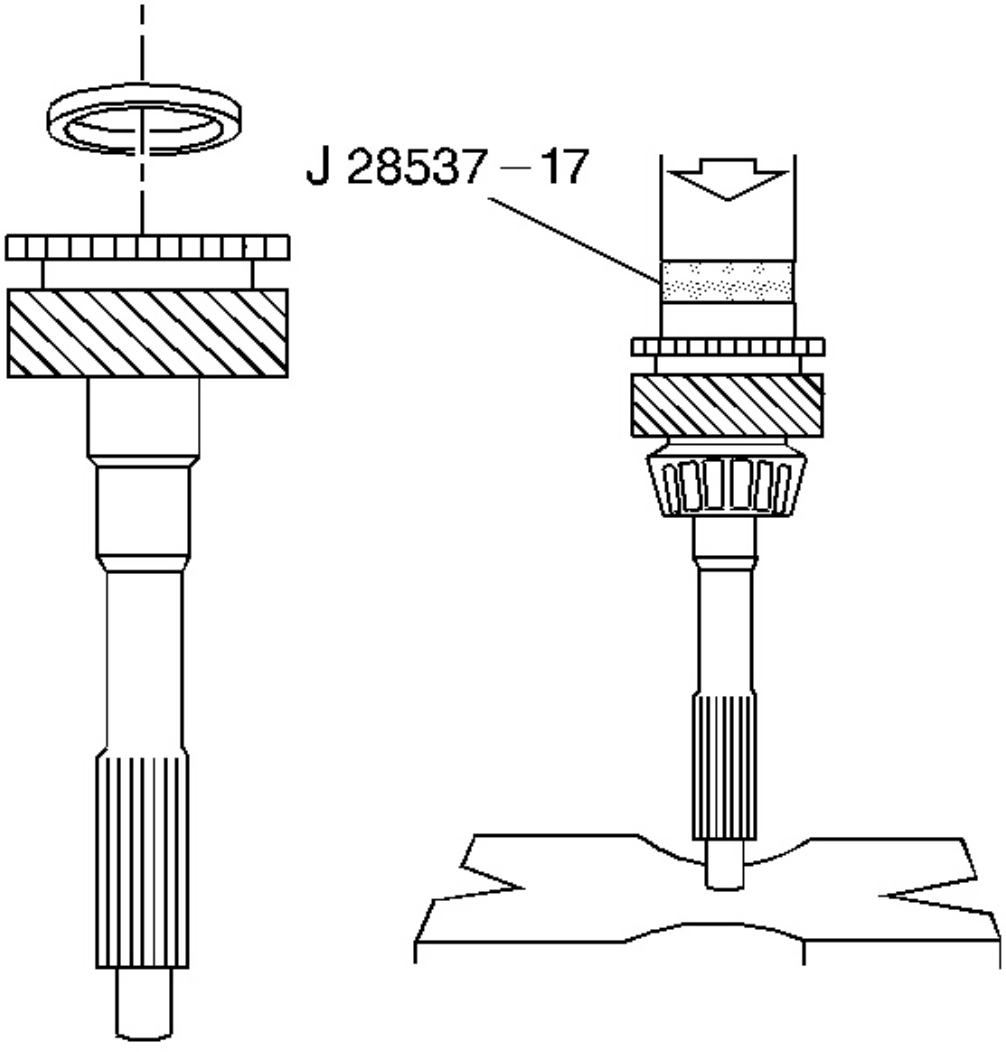


Fig. 340: View Of Input Shaft Bearing Race & J 28537-17
Courtesy of GENERAL MOTORS CORP.

1. Install a new bearing race on the input shaft, using the **J 28537-17** and a hydraulic press. See **Special Tools**.

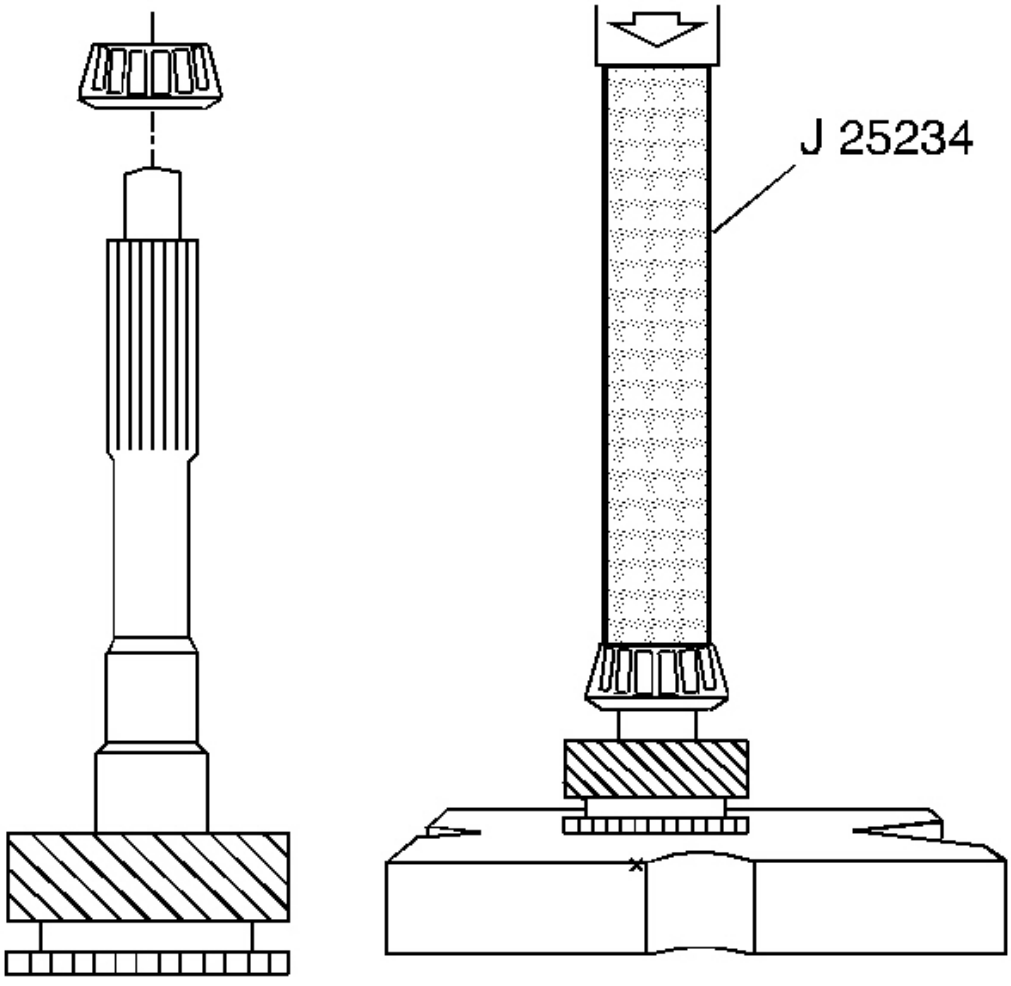


Fig. 341: View Of Tapered Bearing On Input Shaft & J 25234
Courtesy of GENERAL MOTORS CORP.

2. Install a new tapered bearing on the input shaft. Use the **J 25234** and a hydraulic press. See **Special Tools**.

TRANSMISSION ASSEMBLE (Z06)

Shift Shaft Assemblies and Gear Clusters Installation

Tools Required

J 36850 Transjel® Lubricant Assembly Lube. See **Special Tools**.

1. Lubricate all components as assembly progresses, using **J 36850** . See **Special Tools**.

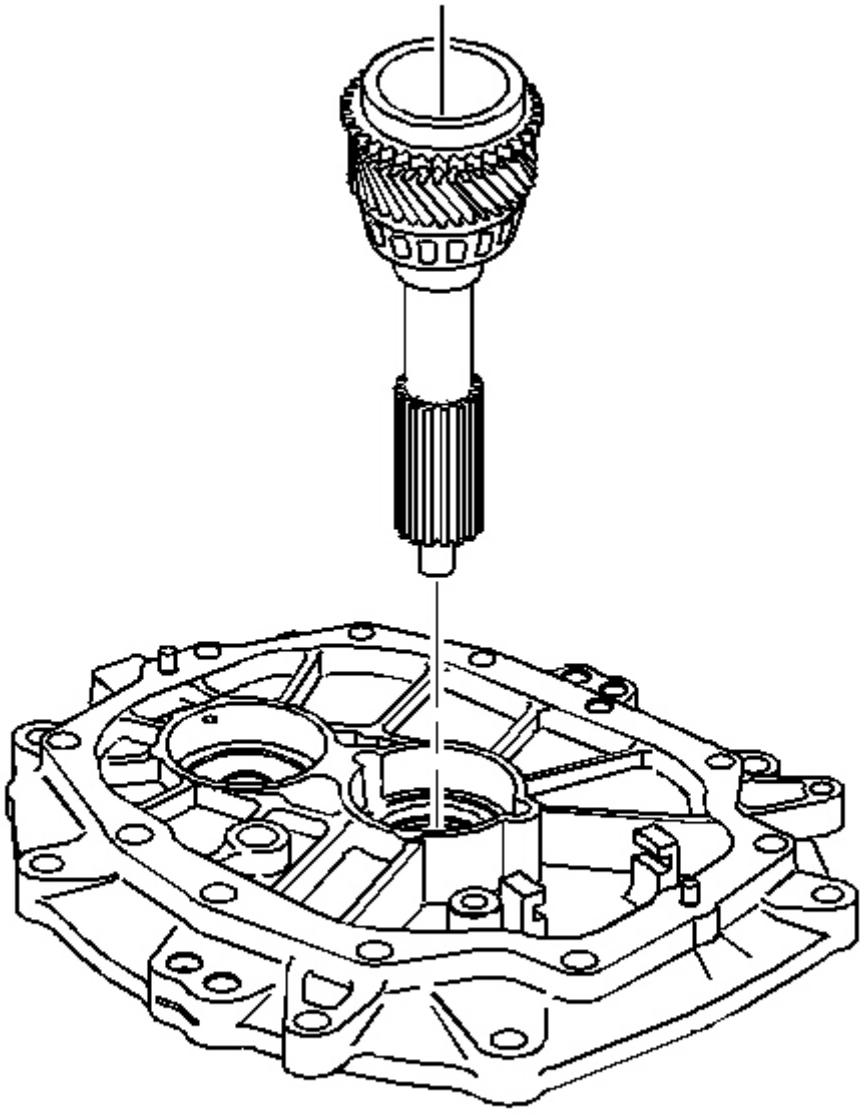


Fig. 342: View Of Input Shaft
Courtesy of GENERAL MOTORS CORP.

2. Install the input shaft in the adapter plate.

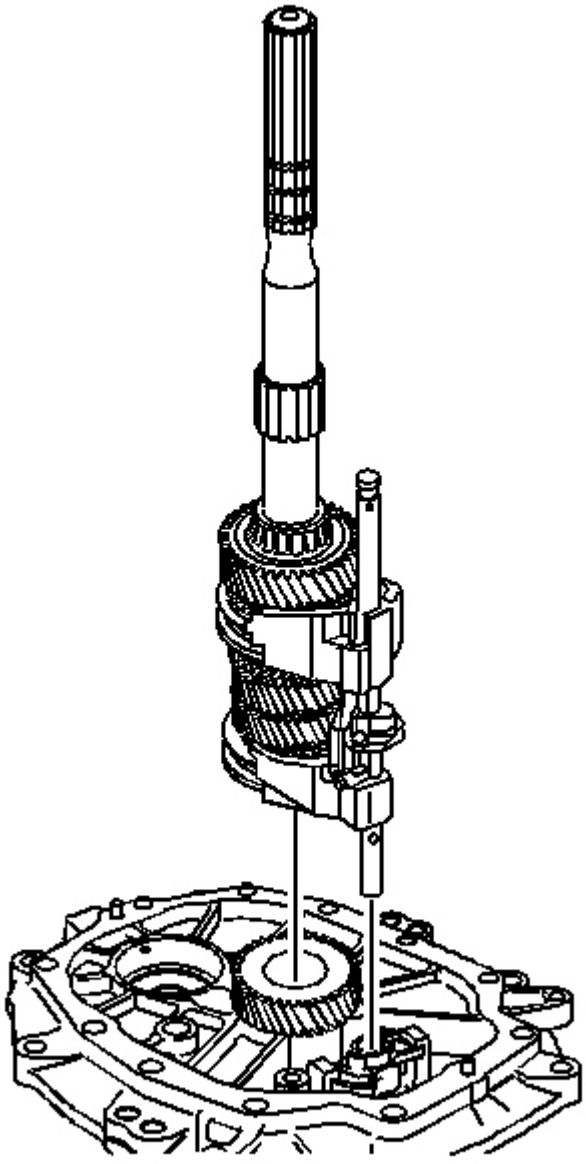


Fig. 343: View Of Mainshaft Assembly & Shift Shaft Components
Courtesy of GENERAL MOTORS CORP.

3. Assemble the shift shaft to the mainshaft.
4. Install the neutral return roll pin to the shift shaft.
5. Install the mainshaft and the shift shaft assembly into the adapter plate.

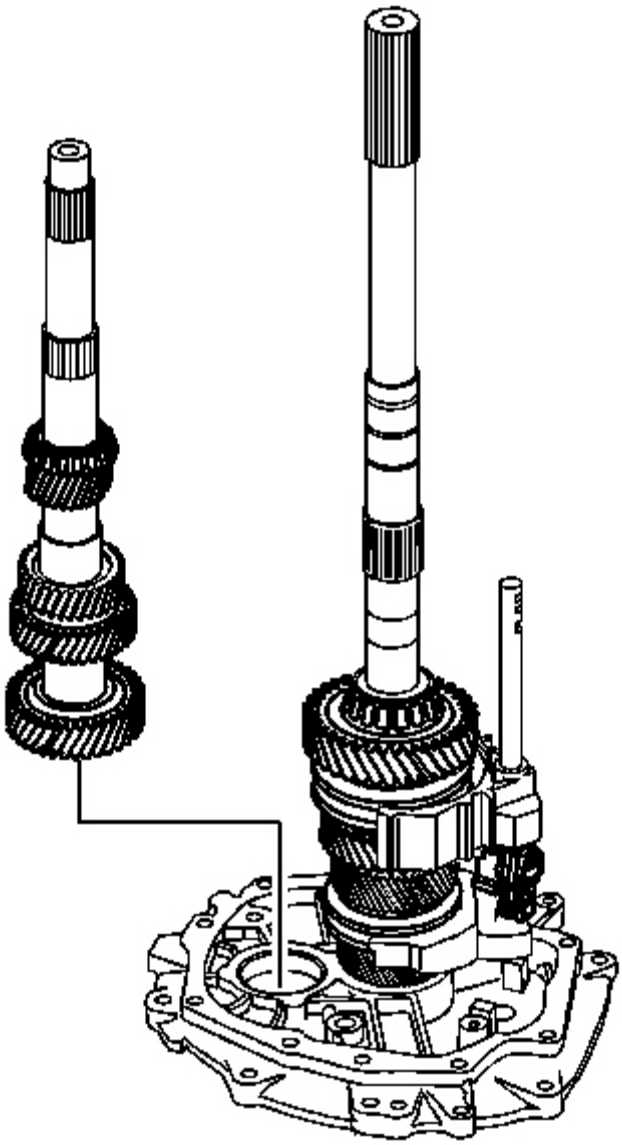


Fig. 344: View Of Countershaft Assembly

Courtesy of GENERAL MOTORS CORP.

6. Install the countershaft assembly using the following sequence:
    1. Lift up the mainshaft assembly enough in order to install the countershaft assembly.
    2. Install the countershaft assembly.
    3. Lift the mainshaft assembly enough in order to rotate the input shaft to engage the synchronizer keys with 4th gear blocking ring.

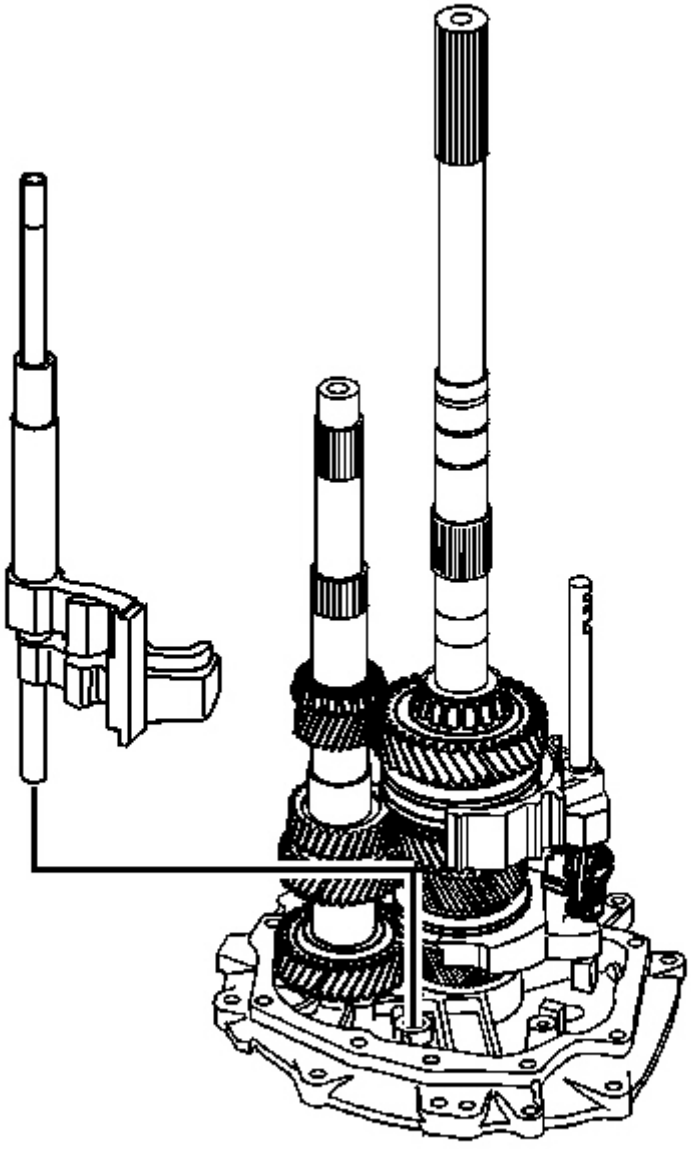


Fig. 345: View Of 5th/6th, Reverse Shift Shaft & Interlock Plate
Courtesy of GENERAL MOTORS CORP.

7. Install the 5th/6th and the reverse shift shaft.

   Align the slots of the shift shaft levers with the interlock plate.

Reverse Lockout Assembly Assemble

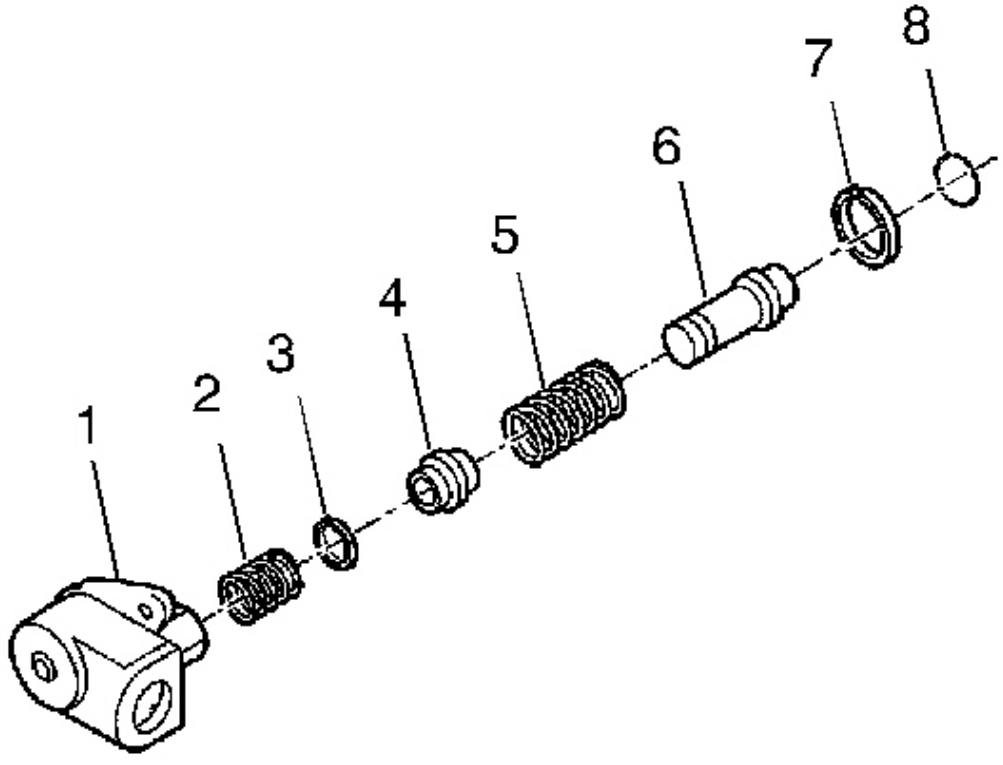


Fig. 346: Exploded View Of Reverse Lockout Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: The reverse lockout assembly is under spring pressure. Exercise caution when removing the retainer ring, as bodily injury may result.

1. Install the reverse lockout plunger (6).
2. Install the reverse lockout outer spring (5).
3. Install the reverse lockout collar (4).
4. Compress the reverse lockout plunger and the collar (4) in a vise and Install the retainer ring (3).
5. Install the reverse lockout inner spring (2).

6. Install the reverse lockout components in the body (1).
7. Install the retainer ring (7).
8. Install the O-ring to body (8).

Transmission Case Installation

Tools Required

- **J 41099** Skip Shift Sensor Remover/Installer. See **Special Tools**.
- **J 36850** Transjel® Lubricant. See **Special Tools**.

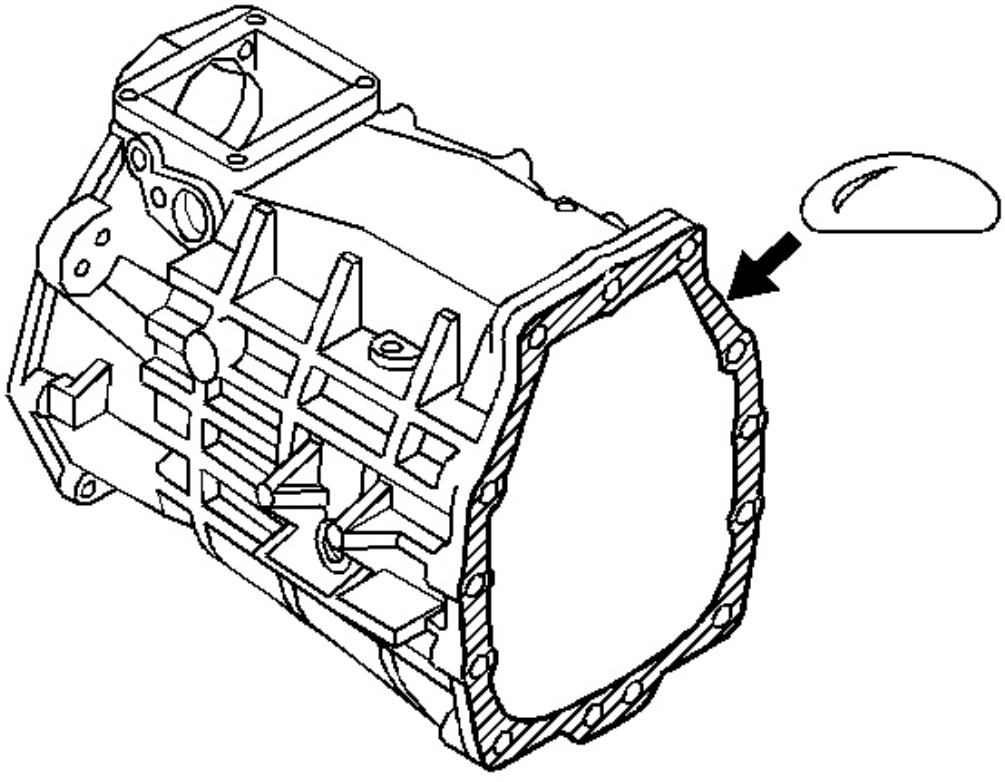


Fig. 347: Sealant Application Points
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Lubricate all components as the assembly progresses. Use J

36850 or the equivalent. See Special Tools.

1. Apply sealant GM P/N 12345739 (Canadian P/N 10953472) or equivalent to the transmission case to adapter plate mating surface.

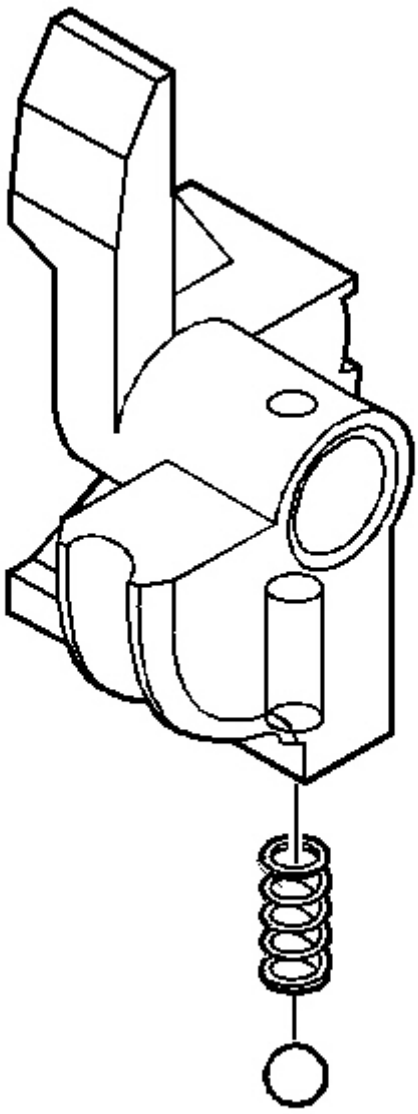


Fig. 348: Inserting Ball Detent & Spring Into Front Offset Lever
Courtesy of GENERAL MOTORS CORP.

2. Install the ball detent and the spring in the front offset lever.

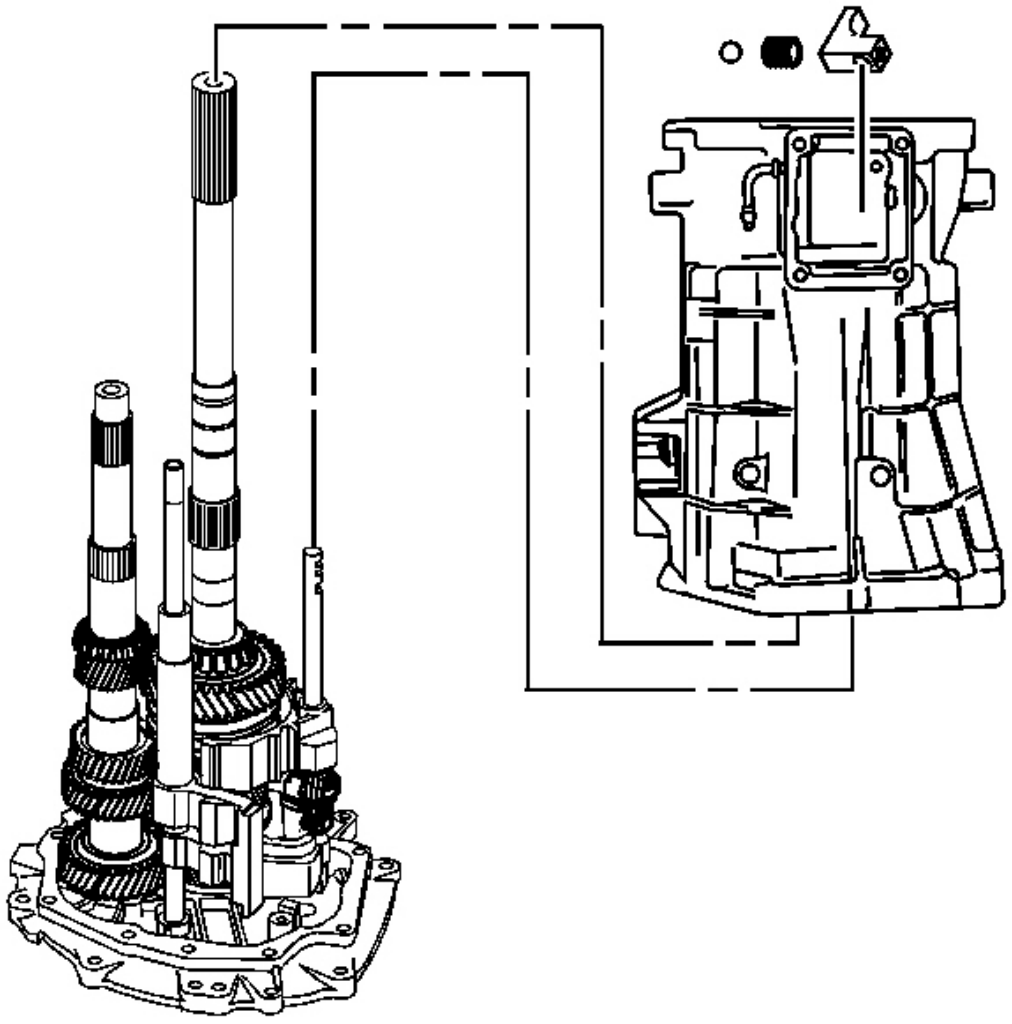


Fig. 349: View Of Transmission Case & Components
Courtesy of GENERAL MOTORS CORP.

3. Do the following in order to install the transmission case and the offset lever:
    1. Shift the transmission into NEUTRAL in order to keep the 3rd/4th shift shaft from engaging.
    2. Install the offset lever.

3. Compress the front offset lever together while sliding it onto the shift shaft. This will prevent the spring release of the inner components.
4. Slide the transmission case onto the gear clusters and the shift rail components.

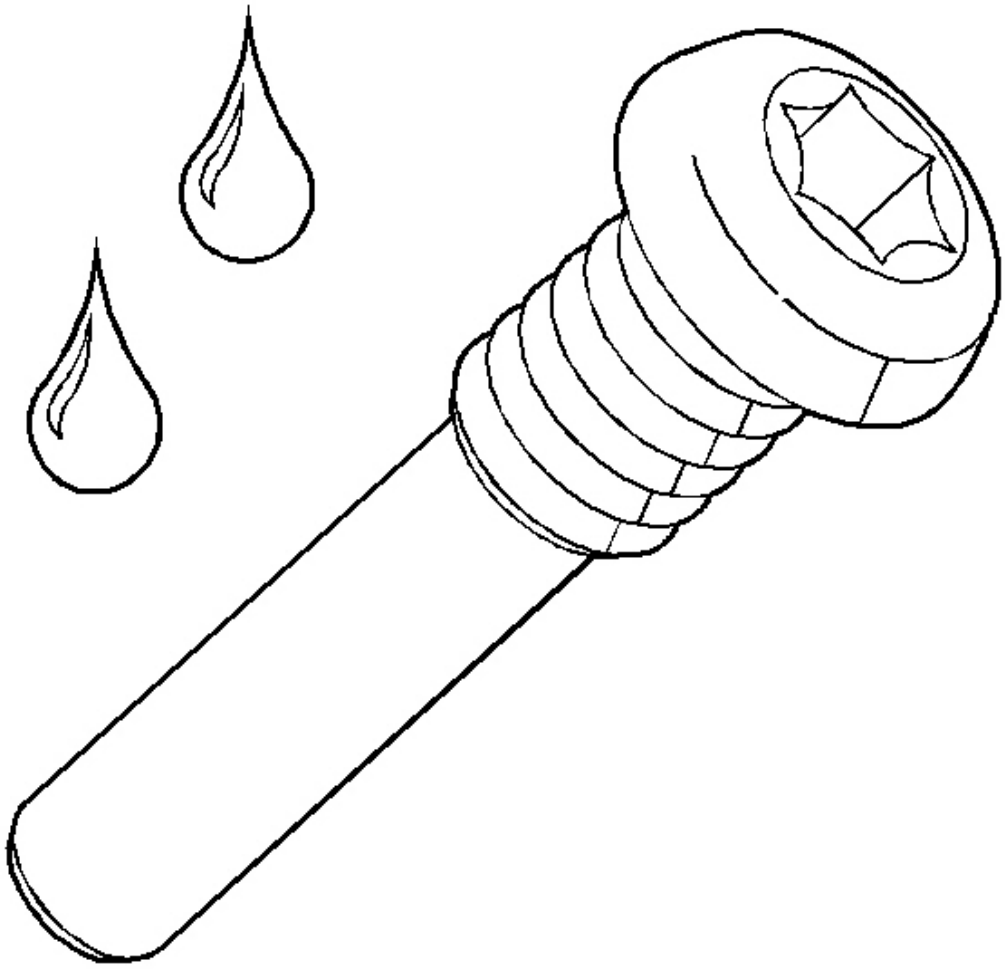


Fig. 350: Applying Sealer To Shift Lever Guide Bolts Threads
Courtesy of GENERAL MOTORS CORP.

4. Apply threadlock GM P/N 12346004 (Canadian P/N 10953480) or equivalent to the threads of the shift lever guide bolts.

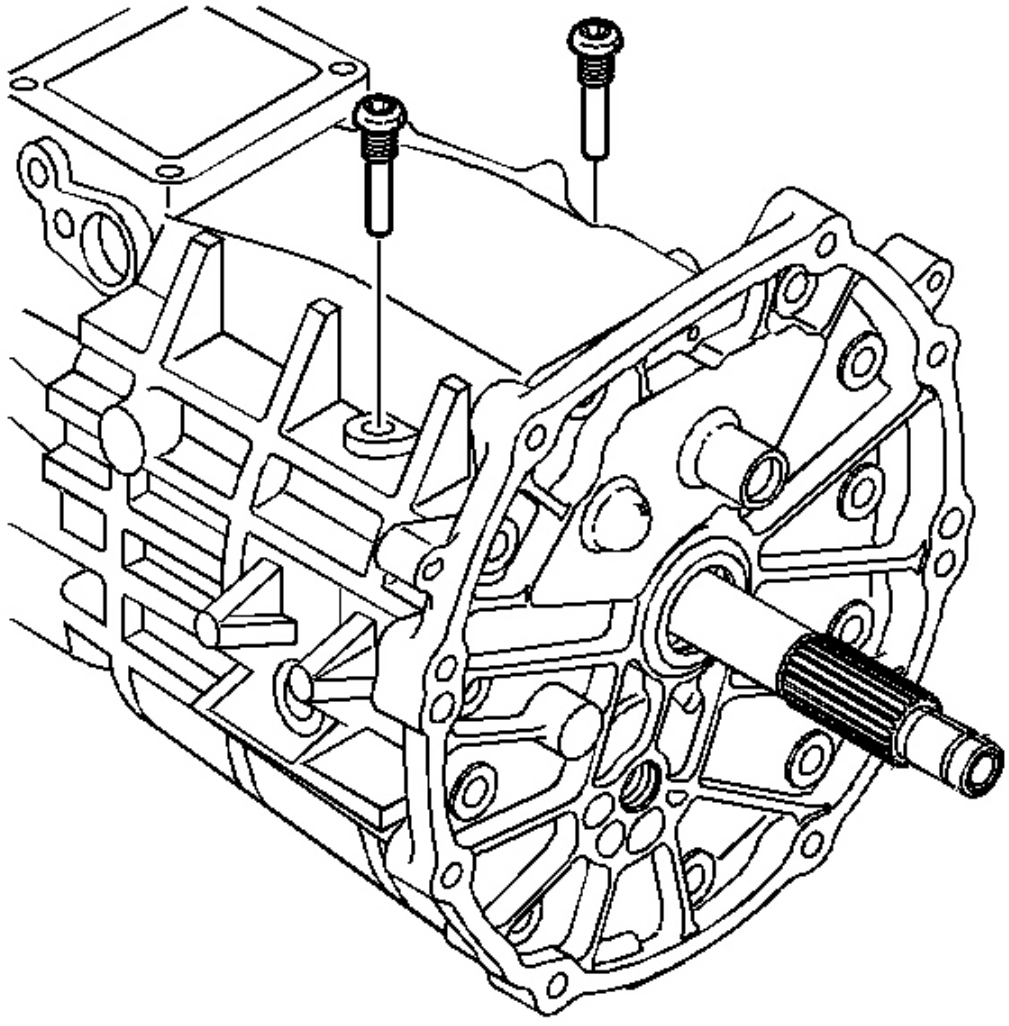


Fig. 351: Locating Shift Lever Guide Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

5. Install the shift lever guide bolts and pull up on 5th/6th and reverse shift rail assembly. This will help align the slot of the shift interlock plate with the guide bolt hole.

   Tighten: Tighten the bolts to 27 N.m (20 Ib ft).

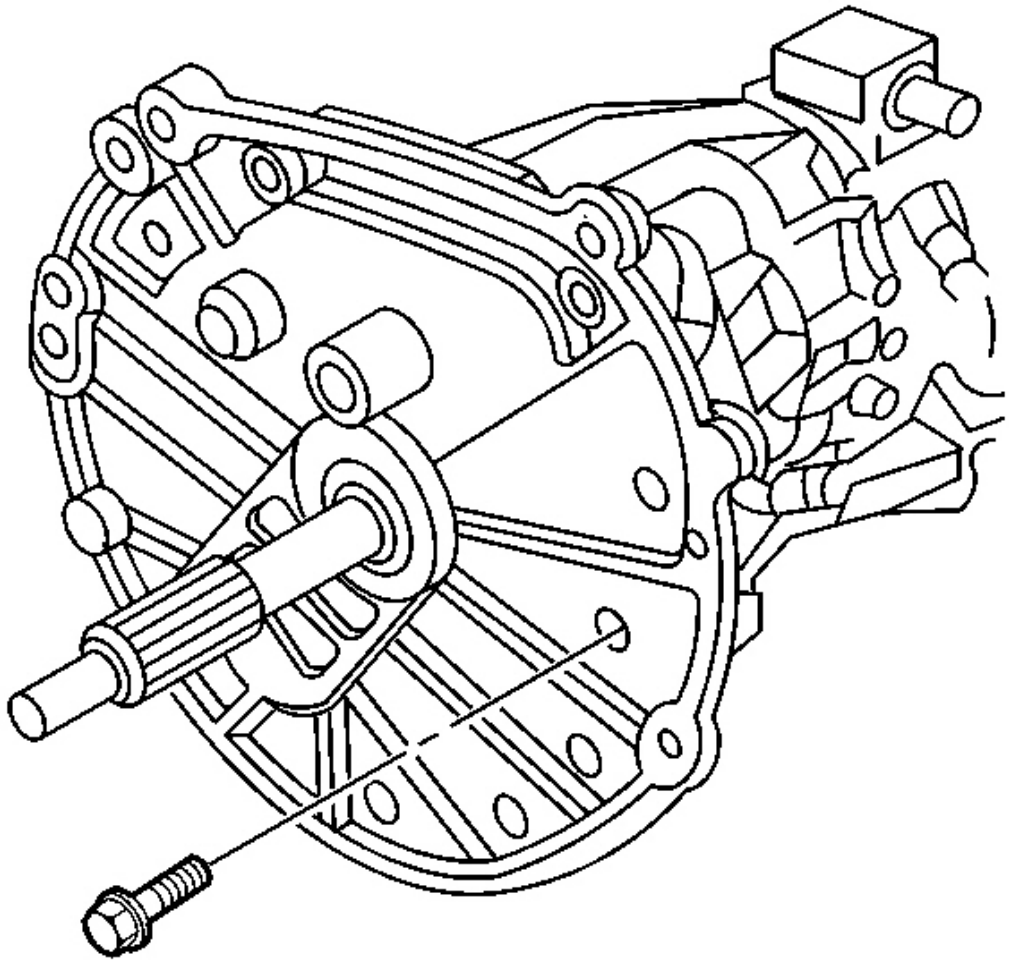


Fig. 352: View Of Adapter Plate & Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

6. Install the adapter plate to transmission case bolts.

   Tighten: Tighten the bolts to 48 N.m (36 Ib ft).

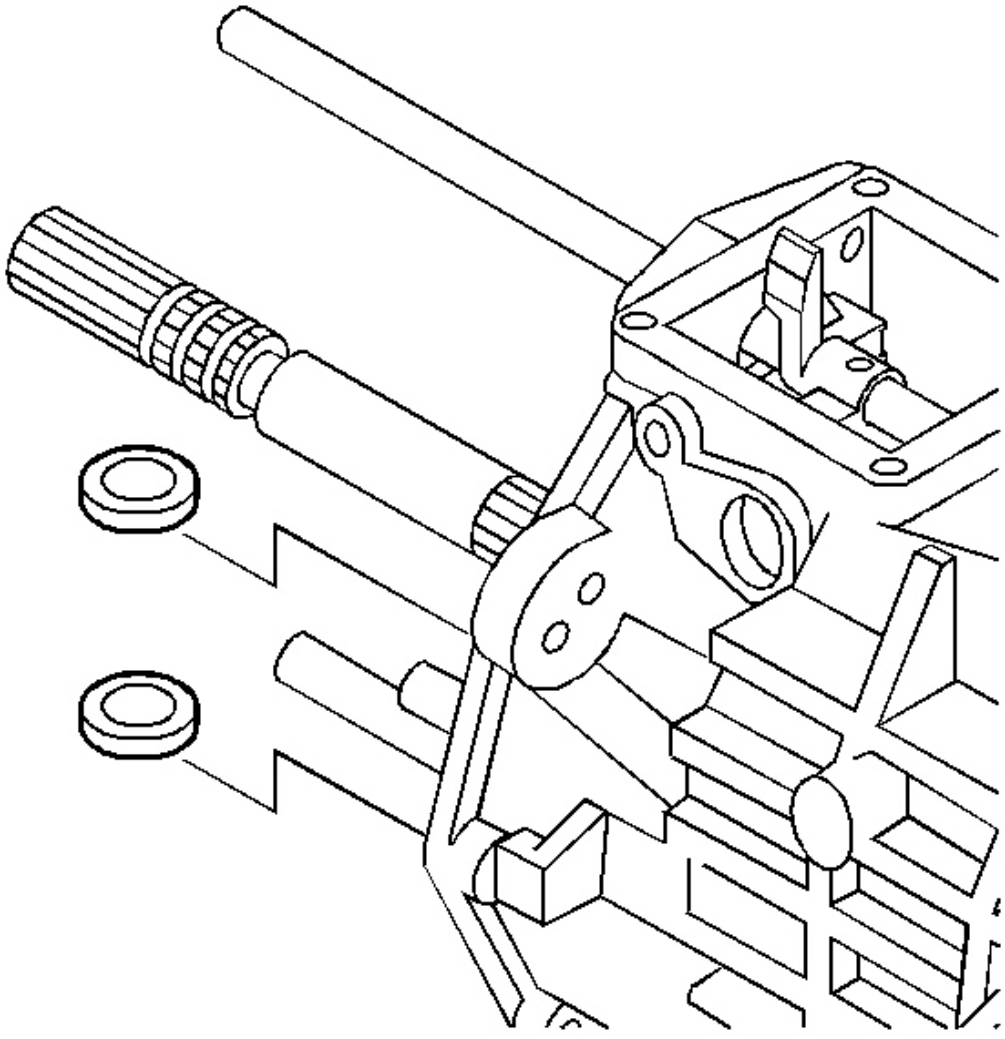


Fig. 353: View Of Transmission Magnets
Courtesy of GENERAL MOTORS CORP.

7. Install the magnets into the transmission case.

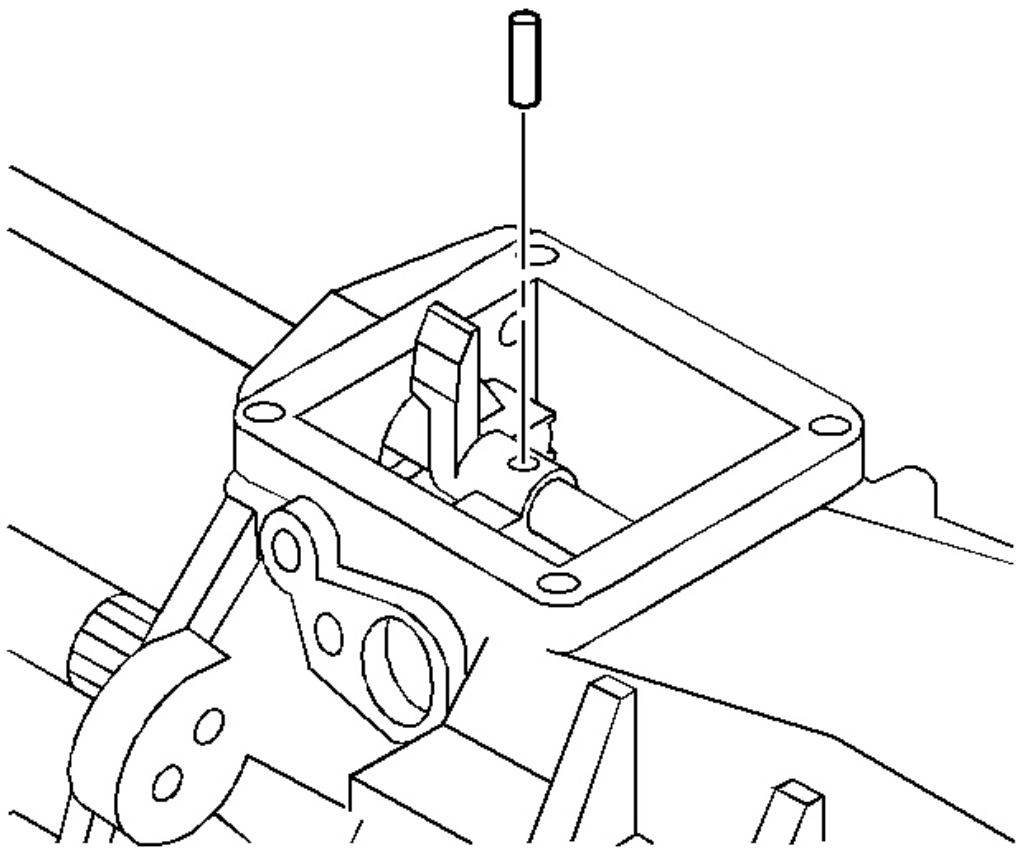


Fig. 354: View Of Offset Lever Roll Pin
Courtesy of GENERAL MOTORS CORP.

8. Install the offset lever roll pin.

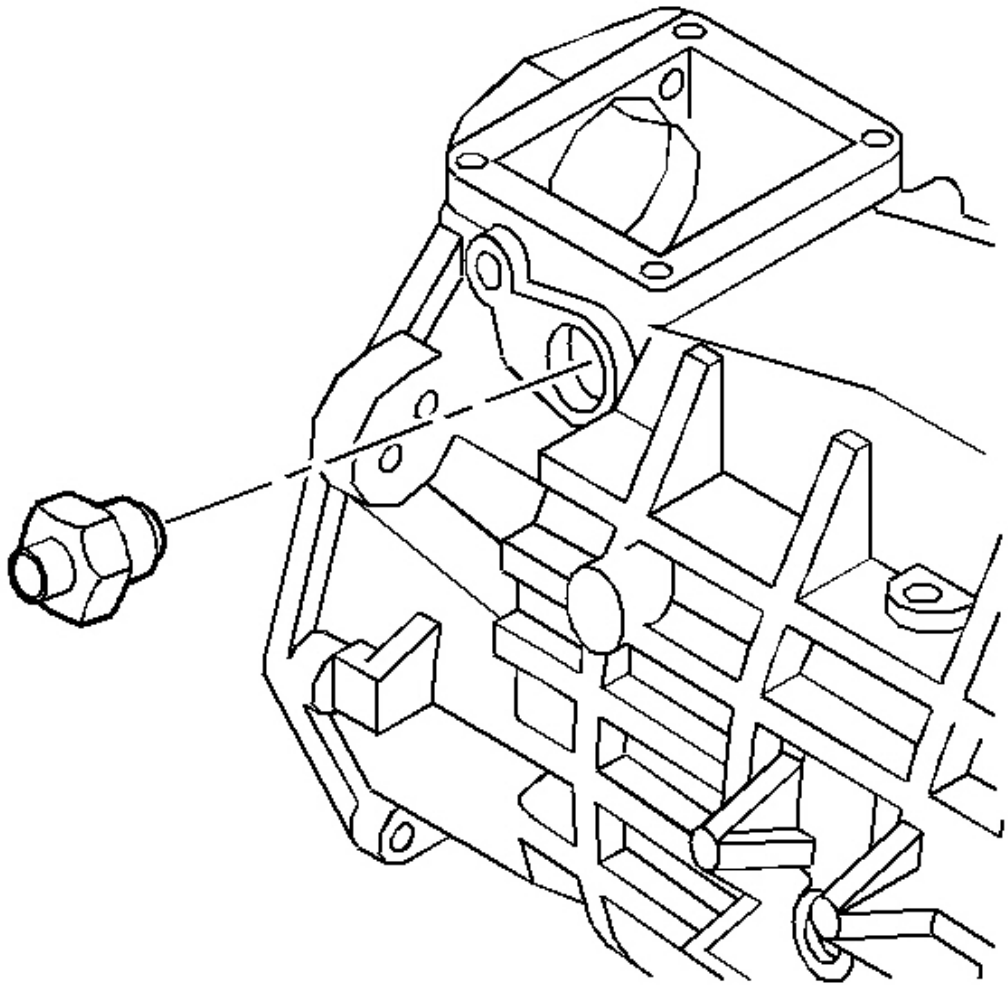


Fig. 355: View Of Shift Detent Assembly
Courtesy of GENERAL MOTORS CORP.

9. Install the shift detent assembly.

   Tighten: Tighten the detent assembly to 40 N.m (30 Ib ft).

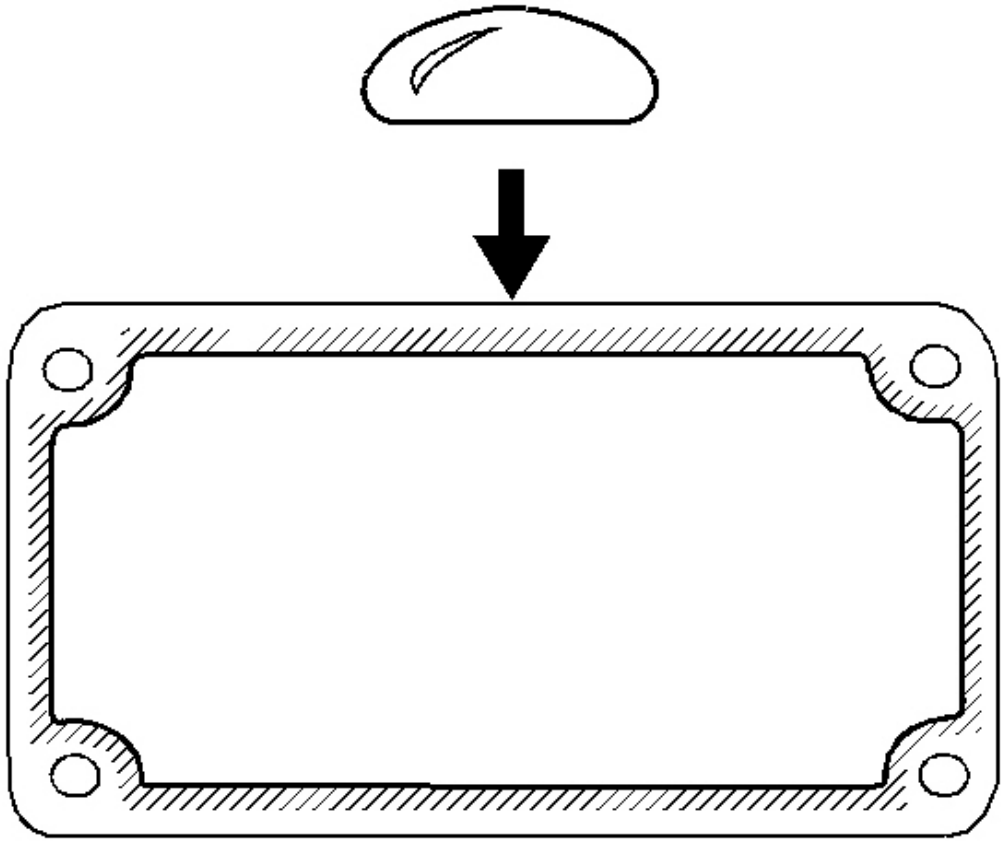


Fig. 356: Applying Sealer To Mating Surface Of Cover Plate
Courtesy of GENERAL MOTORS CORP.

10. Apply sealant GM P/N 12345739 (Canadian P/N 10953472) or the equivalent to the mating surface of the cover plate.

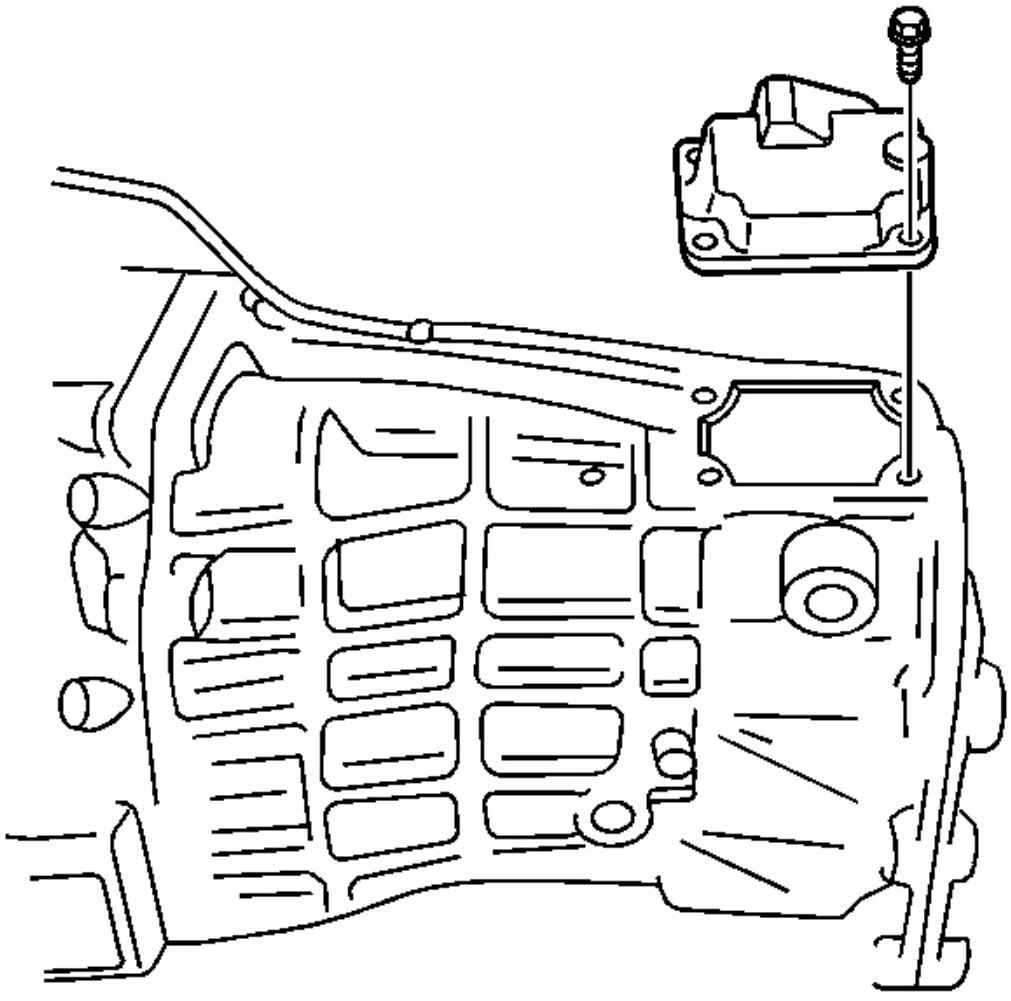


Fig. 357: View Of Shifter Cover Plate & Retainer Bolts
Courtesy of GENERAL MOTORS CORP.

11. Install the transmission case cover and the case cover bolts.

    Tighten: Tighten the bolts to 20 N.m (15 lb ft).

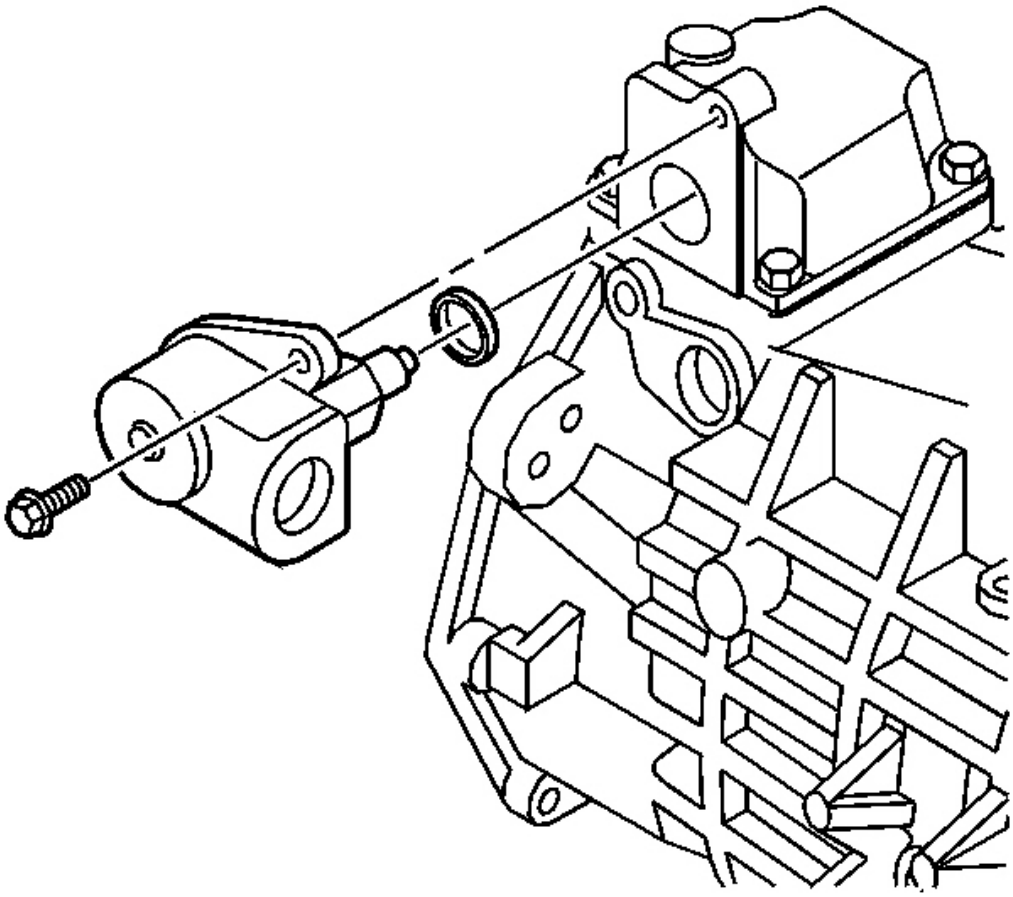


Fig. 358: View Of Reverse Lockout Body & Bolt
Courtesy of GENERAL MOTORS CORP.

12. Install the reverse lockout body and bolt in the cover plate.

    Tighten: Tighten the bolts to 18 N.m (13 Ib ft).

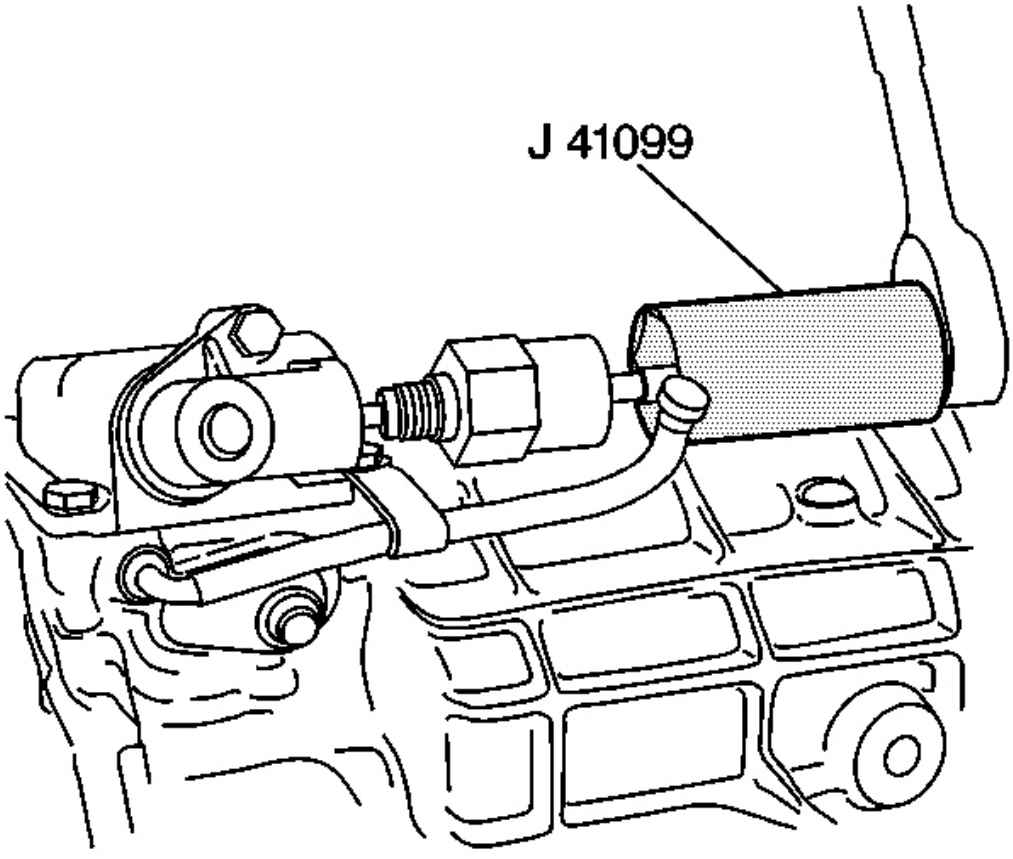


Fig. 359: J 41099 & Reverse Lockout Solenoid
Courtesy of GENERAL MOTORS CORP.

13. Install the reverse lockout solenoid to reverse lockout body assembly, using the **J 41099** . See **Special Tools**.

    Tighten: Tighten the solenoid to 40 N.m (30 Ib ft).

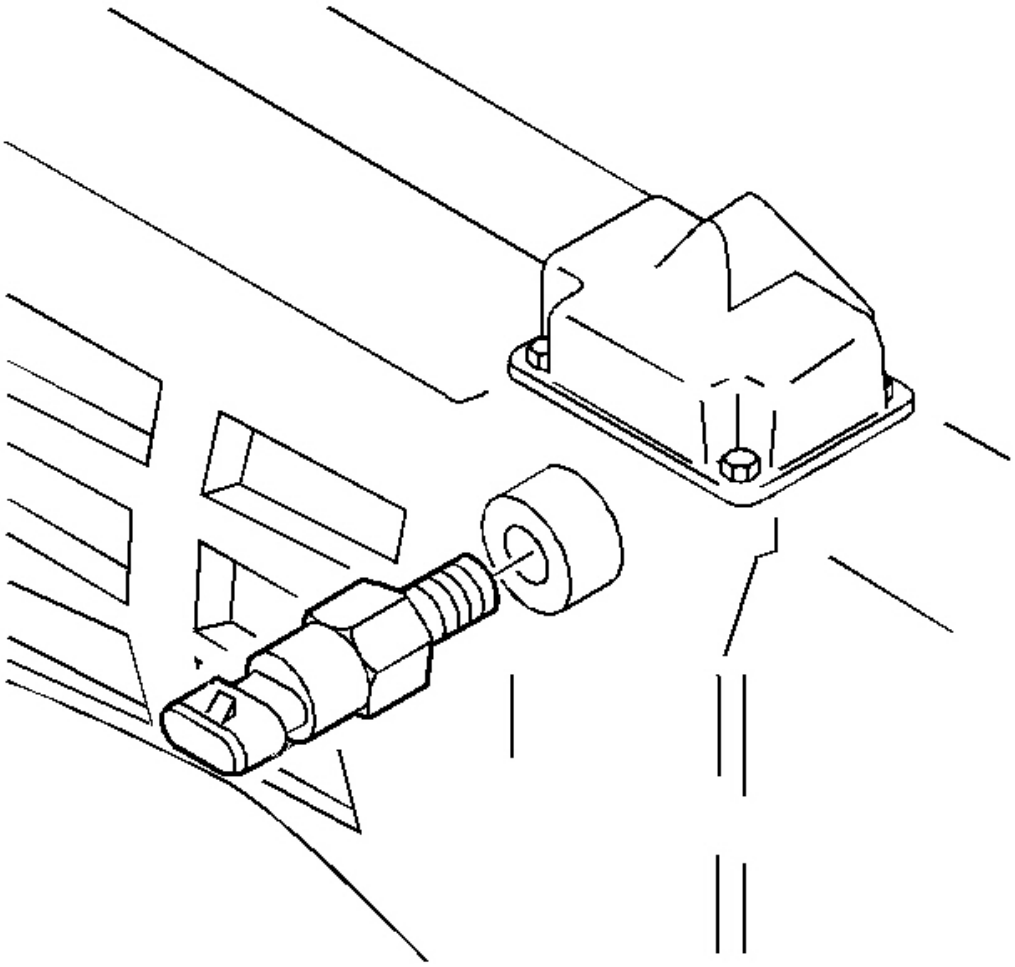


Fig. 360: Identifying Computer Aided Gear Select Solenoid
Courtesy of GENERAL MOTORS CORP.

14. Install the computer aided gear select solenoid.

    Tighten: Tighten the solenoid to 40 N.m (30 Ib ft).

Countershaft Gear Installation

Tools Required

J 5590 Press Tube. See **Special Tools**.

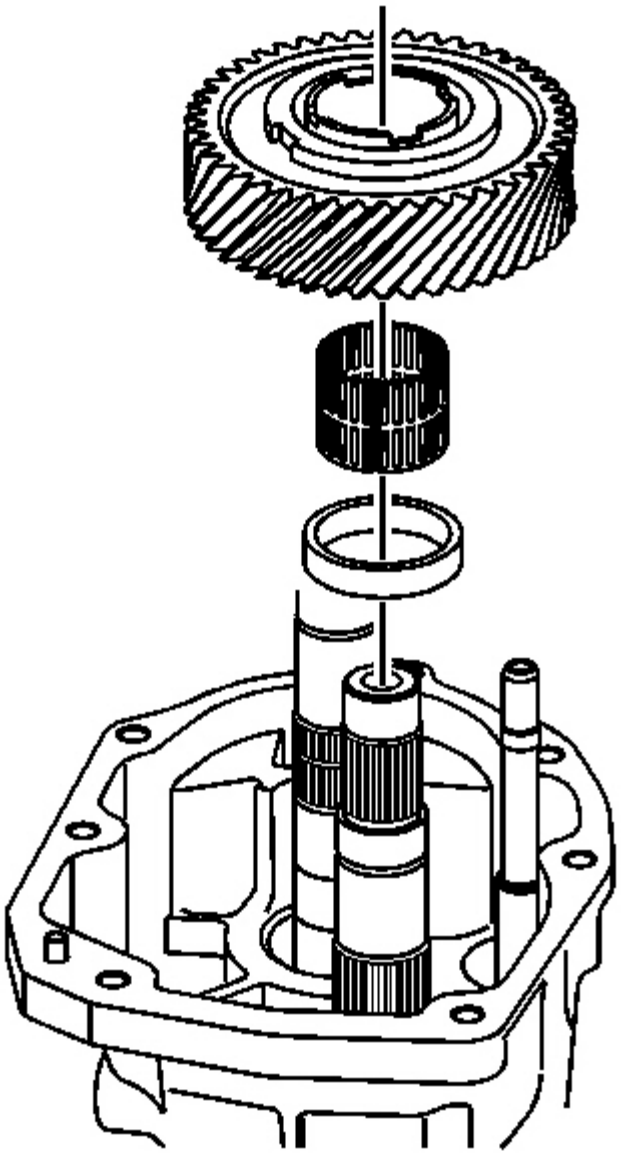


Fig. 361: View Of 6th Driven Gear, Caged Needle Bearing & Spacer
Courtesy of GENERAL MOTORS CORP.

1. Install the spacer, caged needle bearing, and the 6th driven gear.

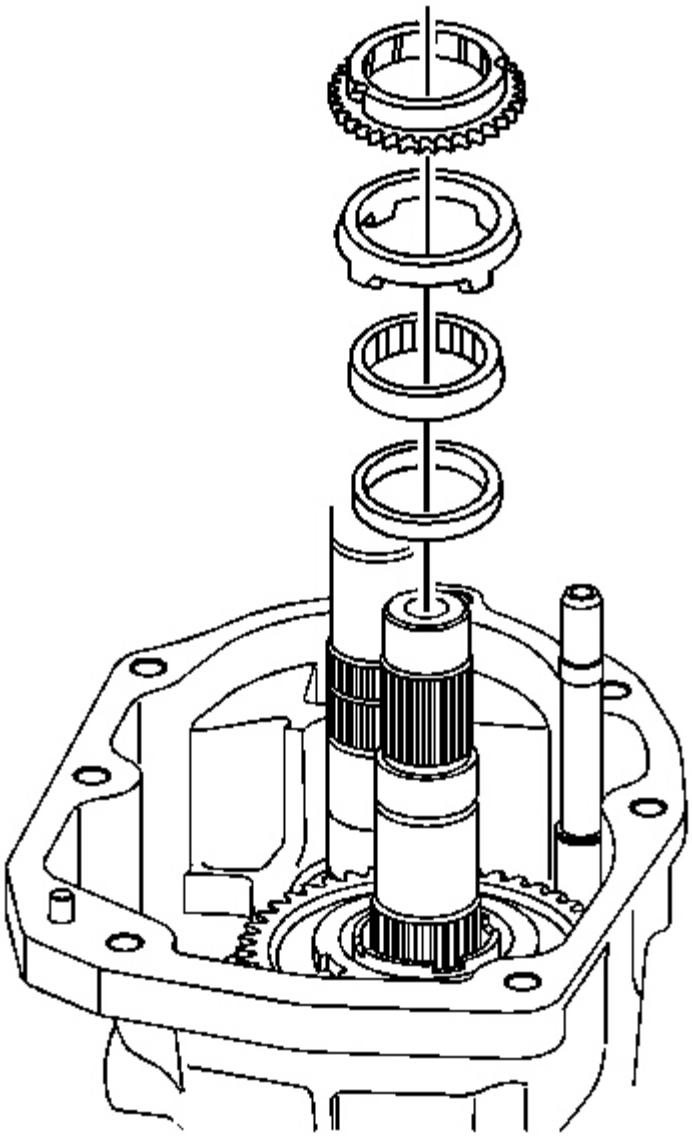


Fig. 362: View Of 5th/6th Shift Fork, Synchronizer Sleeve, Speed Drive Gear Synchronizer Blocking Ring, Friction Cone, Inner Cone & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

2. Install the speed drive gear synchronizer blocking ring, speed drive gear friction cone, speed drive gear inner cone and speed drive gear thrust washer.

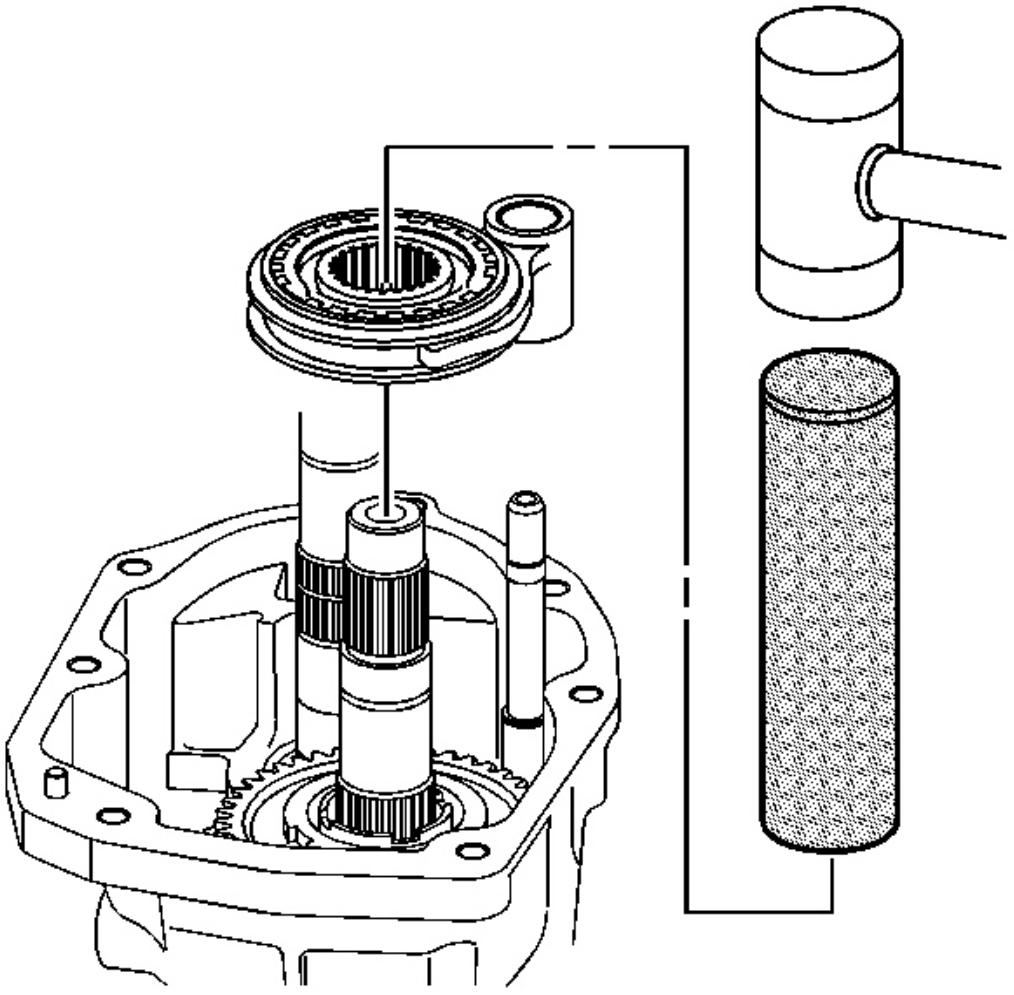


Fig. 363: View Of J 5590, 5th/6th Shift Fork, Synchronizer Sleeve & Synchronizer Hub Assembly
Courtesy of GENERAL MOTORS CORP.

3. Install the 5th/6th shift fork, synchronizer sleeve and synchronizer hub assembly using **J 5590** and a mallet. See **Special Tools**.

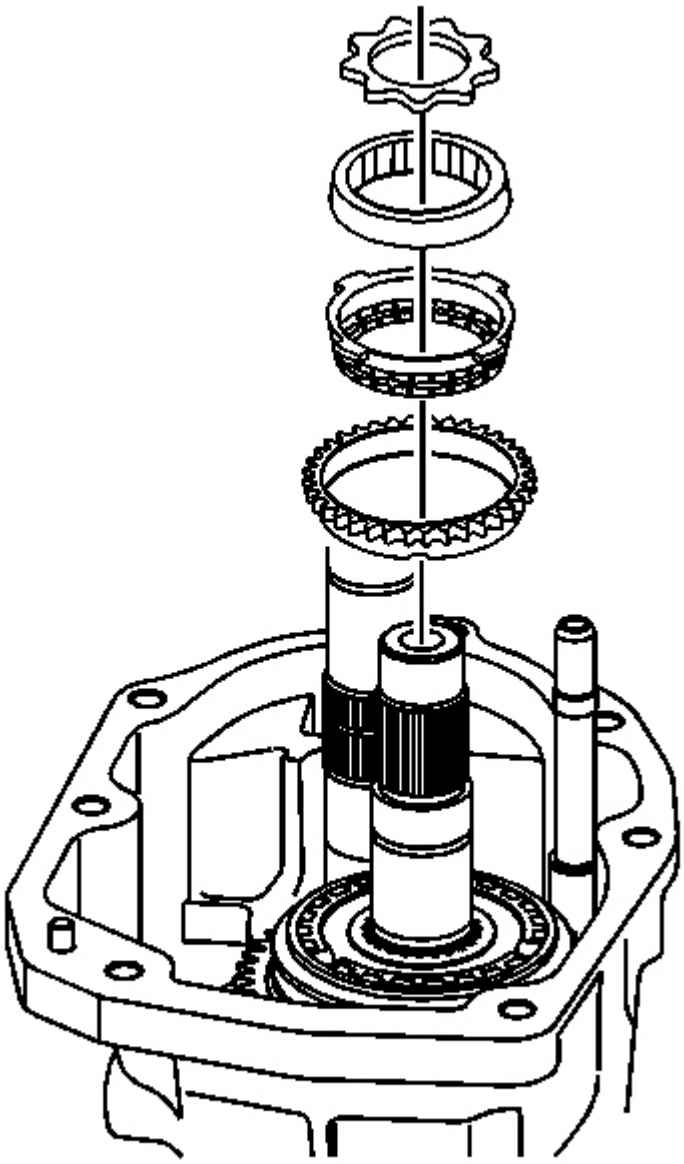


Fig. 364: View Of Speed Drive Gear Synchronizer Blocking Ring, Friction Cone, Inner Cone & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

4. Install the speed drive gear synchronizer blocking ring, speed drive gear friction cone, speed drive gear inner cone and speed drive gear thrust washer.

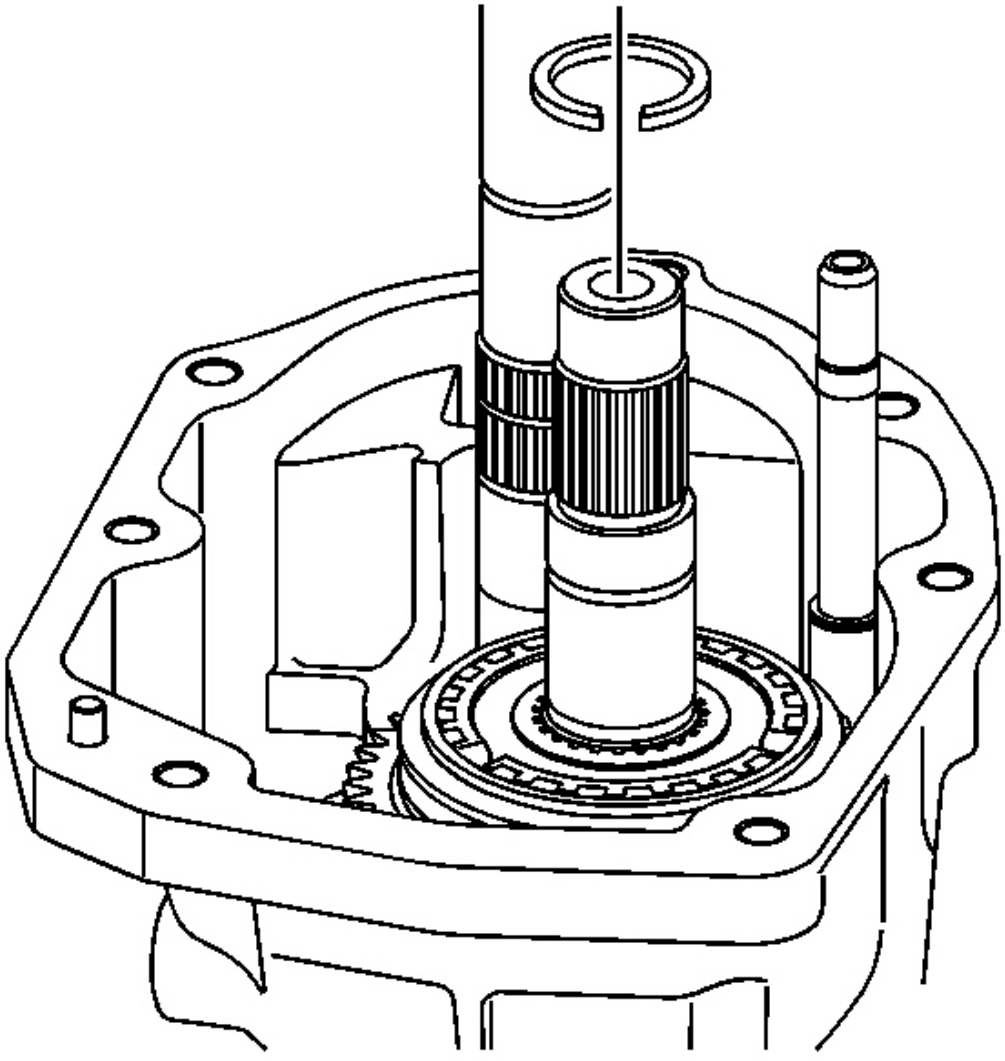


Fig. 365: View Of Retainer Clip
Courtesy of GENERAL MOTORS CORP.

5. Install the retainer clip from the countershaft.

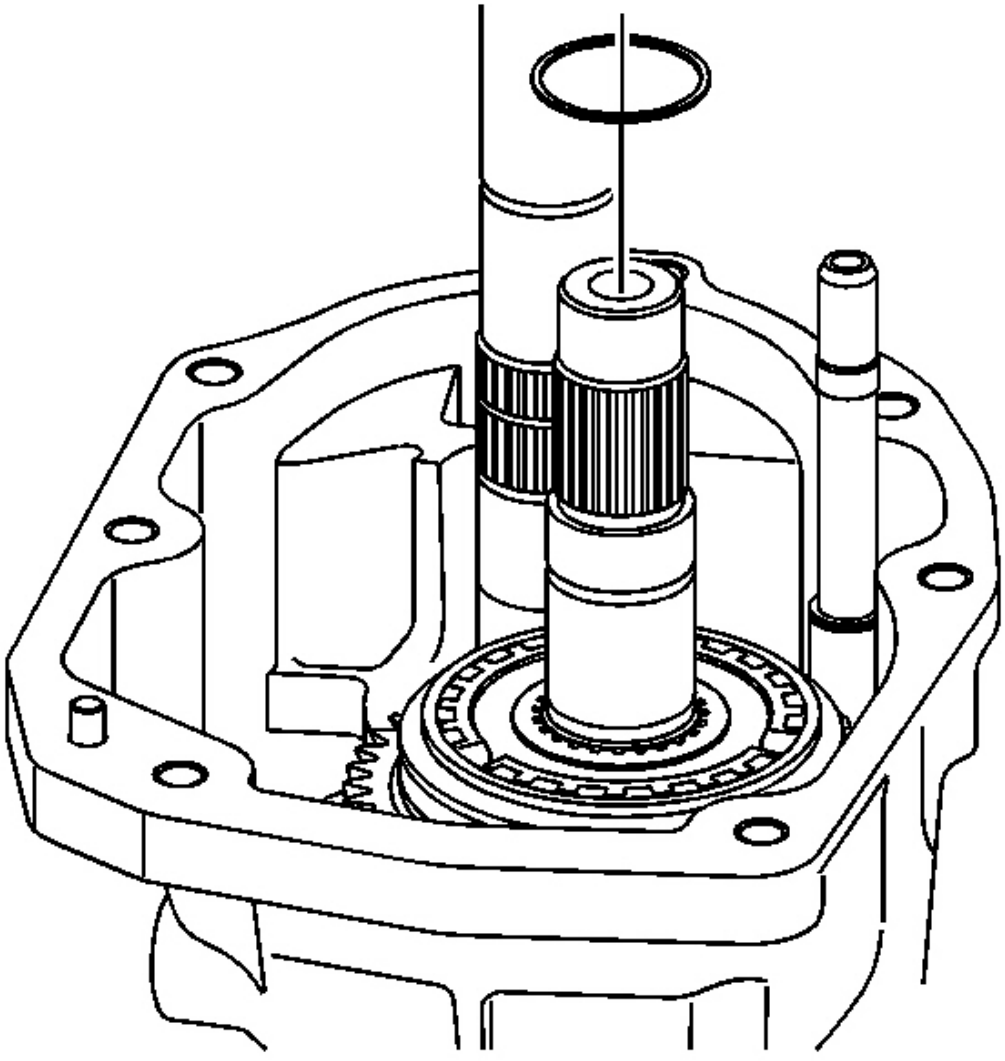


Fig. 366: View Of Countershaft Spacer
Courtesy of GENERAL MOTORS CORP.

6. Remove the spacer from the countershaft.

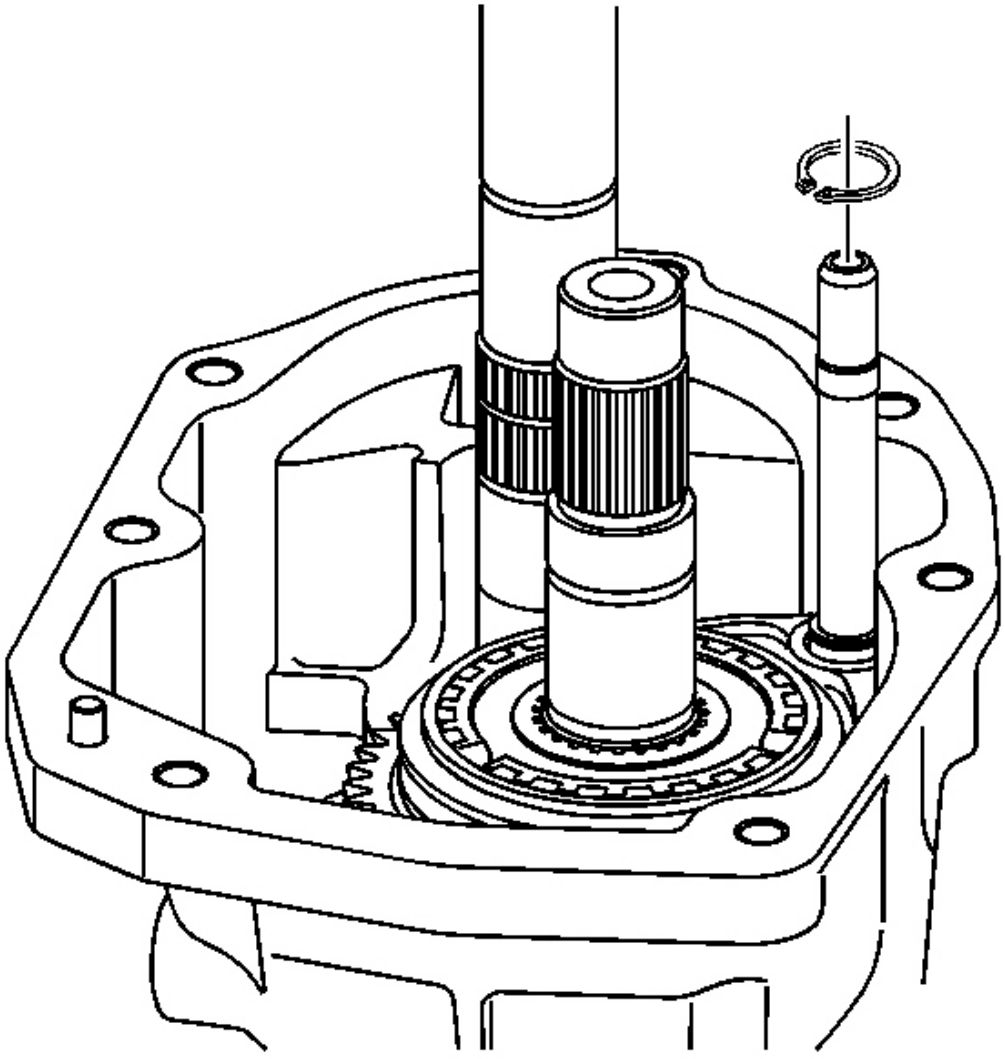


Fig. 367: View Of 5th/6th Speed Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

7. Install the 5th/6th speed shift fork retainer ring.

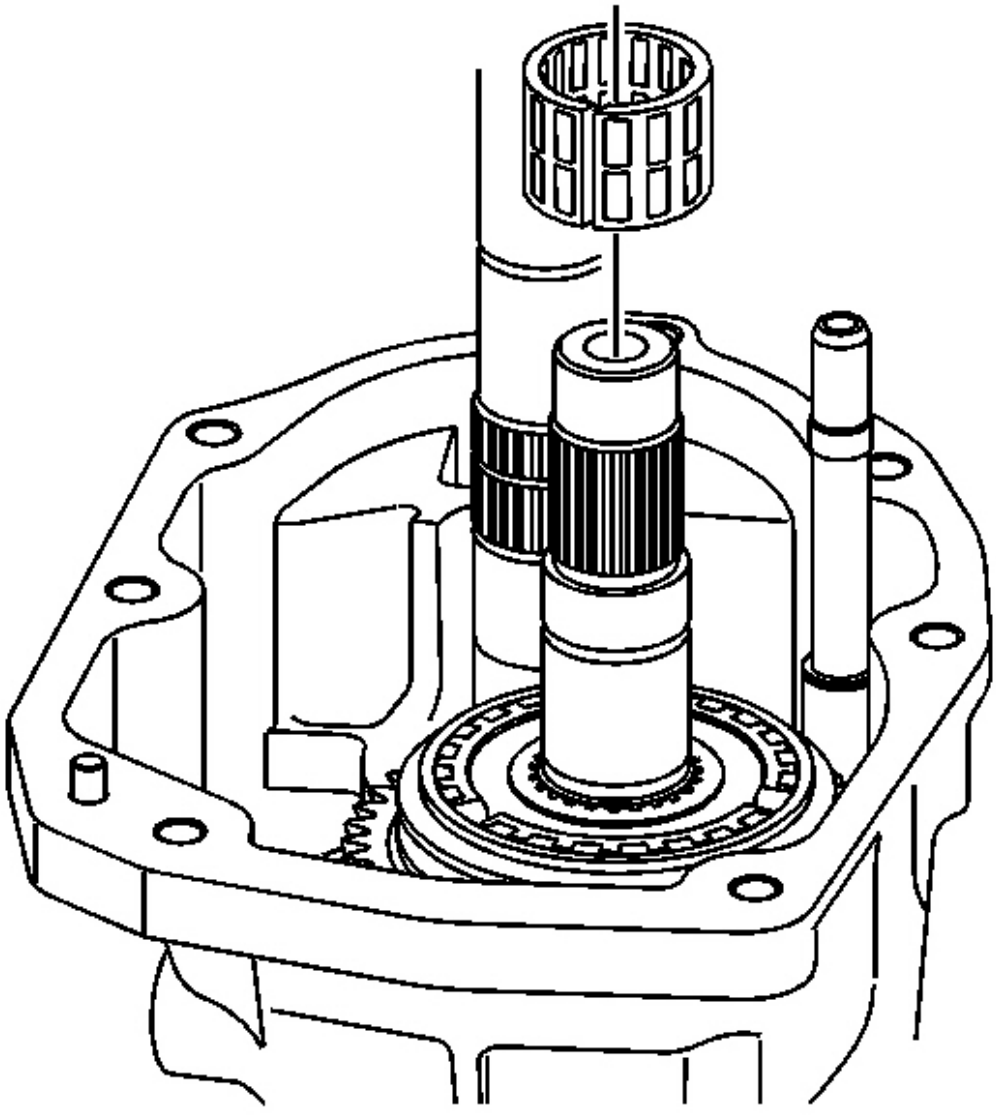


Fig. 368: View Of Needle Bearing
Courtesy of GENERAL MOTORS CORP.

8. Install the needle bearing from the countershaft.

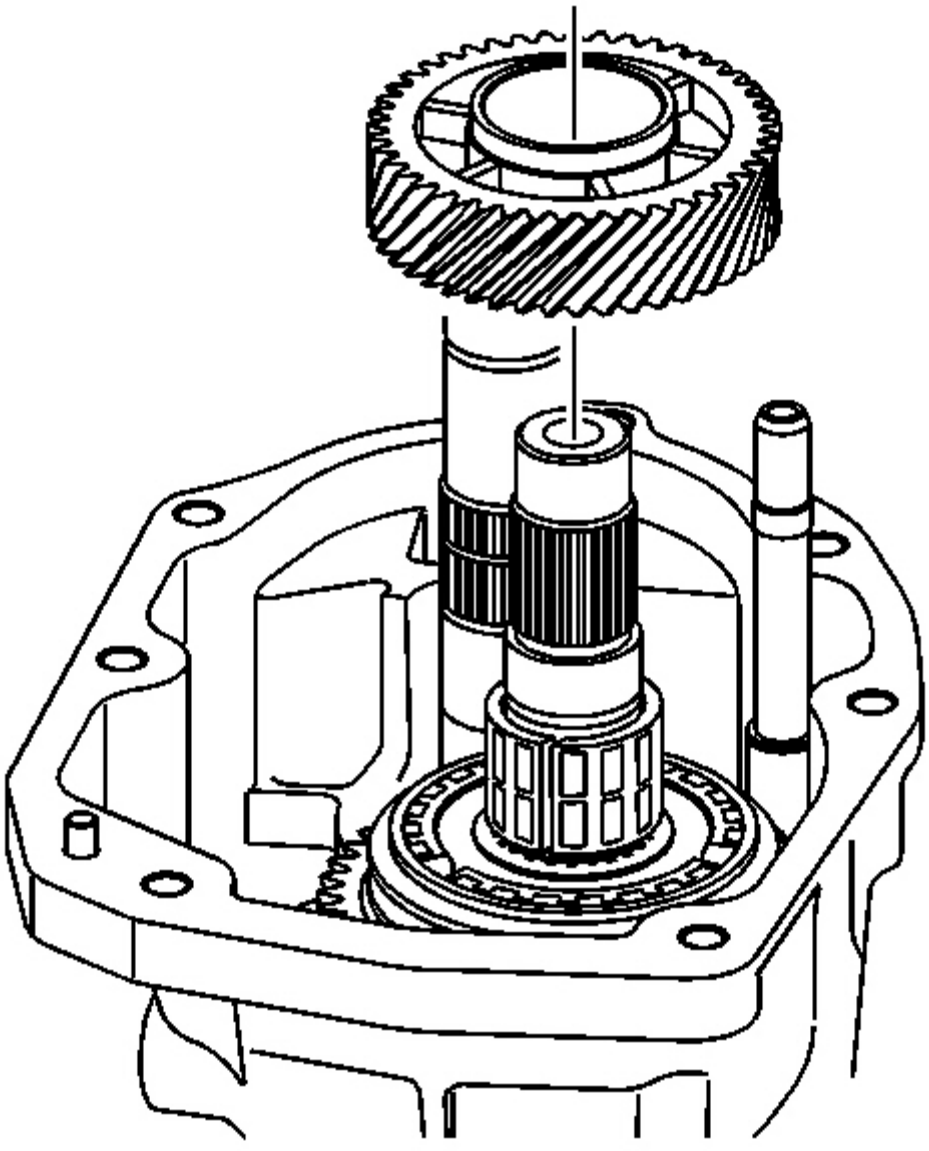


Fig. 369: View Of Countershaft Gear
Courtesy of GENERAL MOTORS CORP.

9. Install the gear from the countershaft.

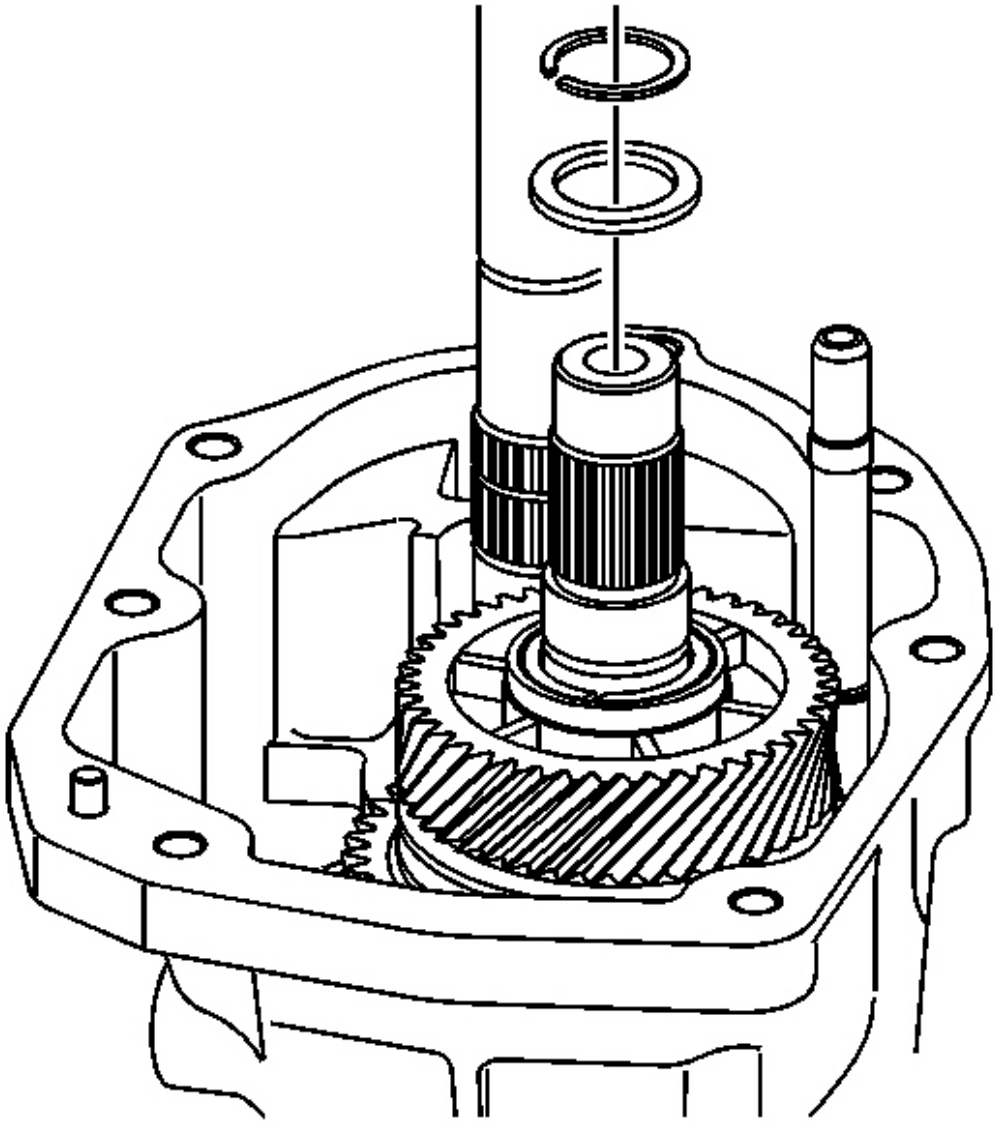


Fig. 370: View Of Countershaft Retainer And Spacer
Courtesy of GENERAL MOTORS CORP.

10. Install the spacer and the countershaft retainer.

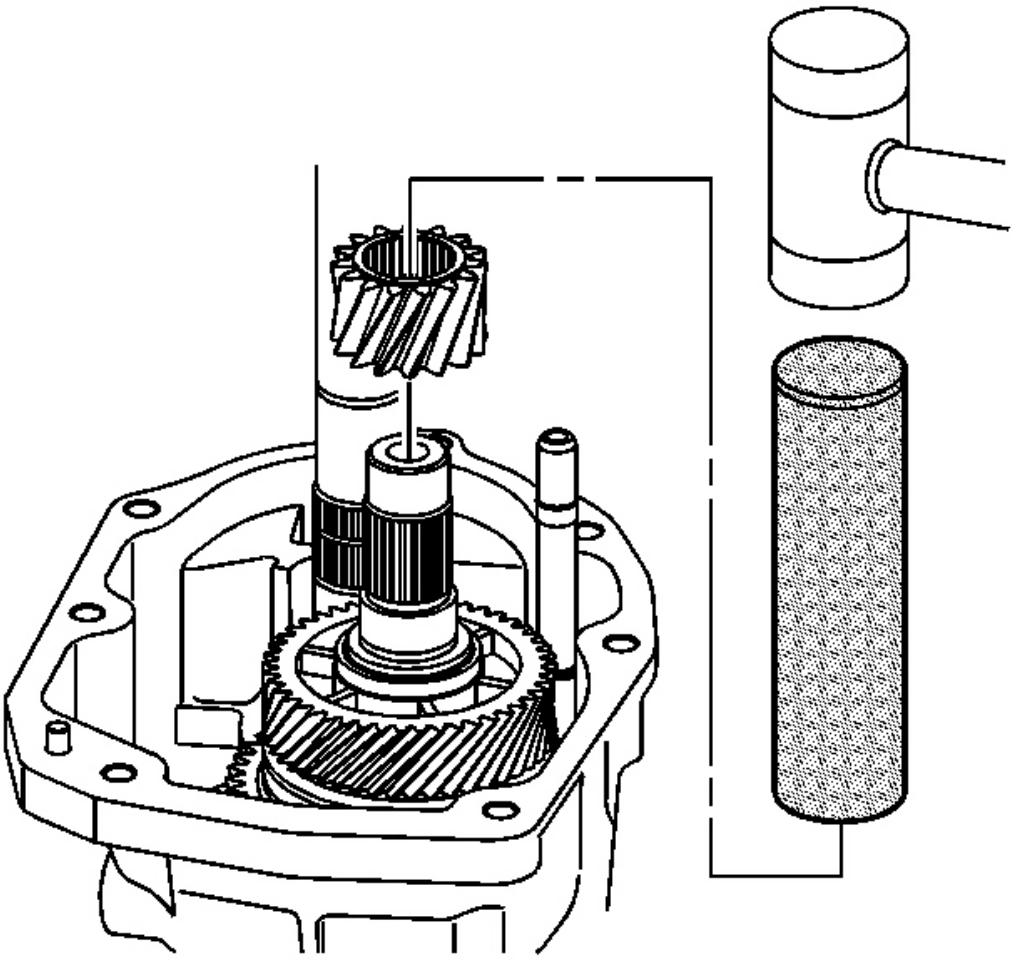


Fig. 371: View Of Countershaft Gear & Special Tool
Courtesy of GENERAL MOTORS CORP.

11. Install the countershaft gear using **J 5590** and a mallet. See **Special Tools**.

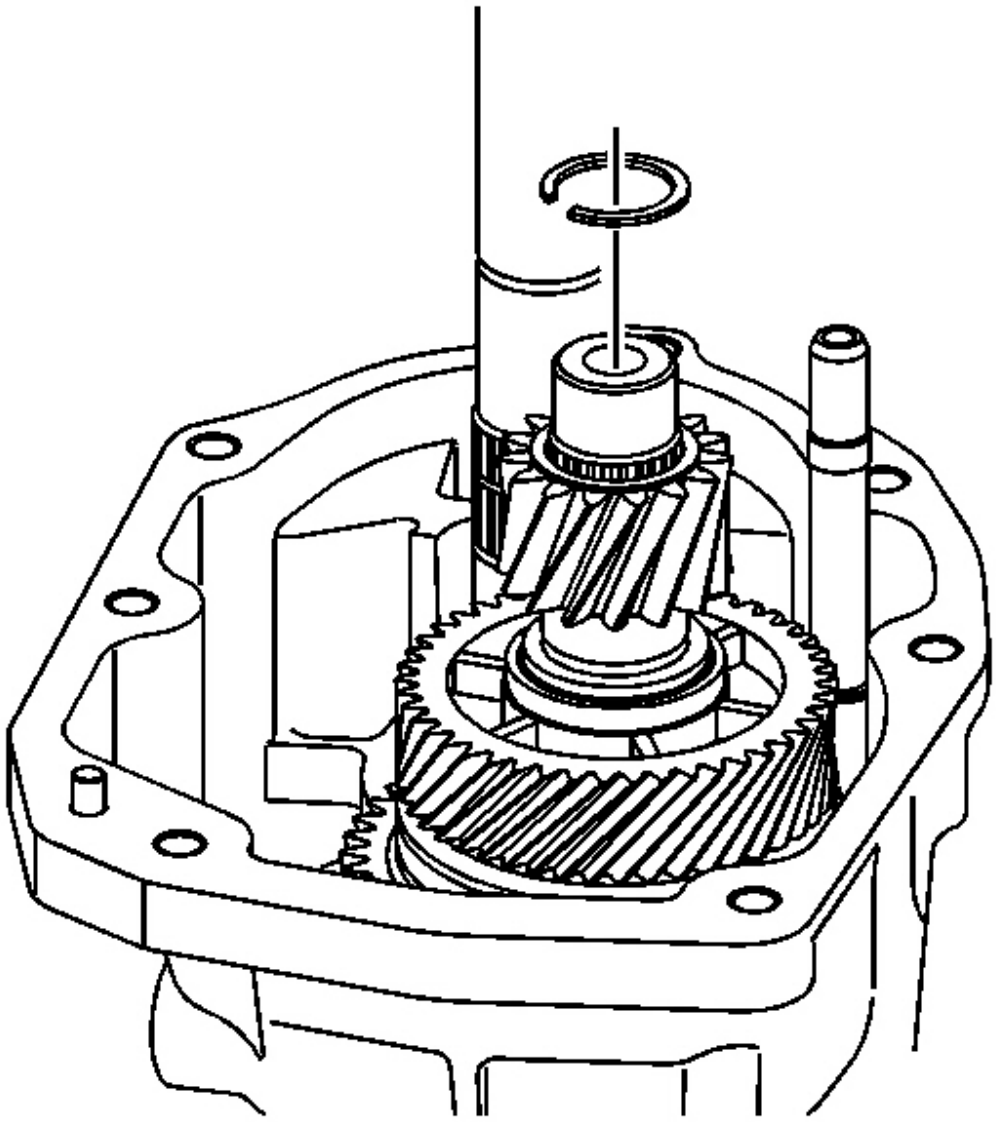


Fig. 372: View Of Countershaft Retainer Clip
Courtesy of GENERAL MOTORS CORP.

12. Install the countershaft retainer clip.

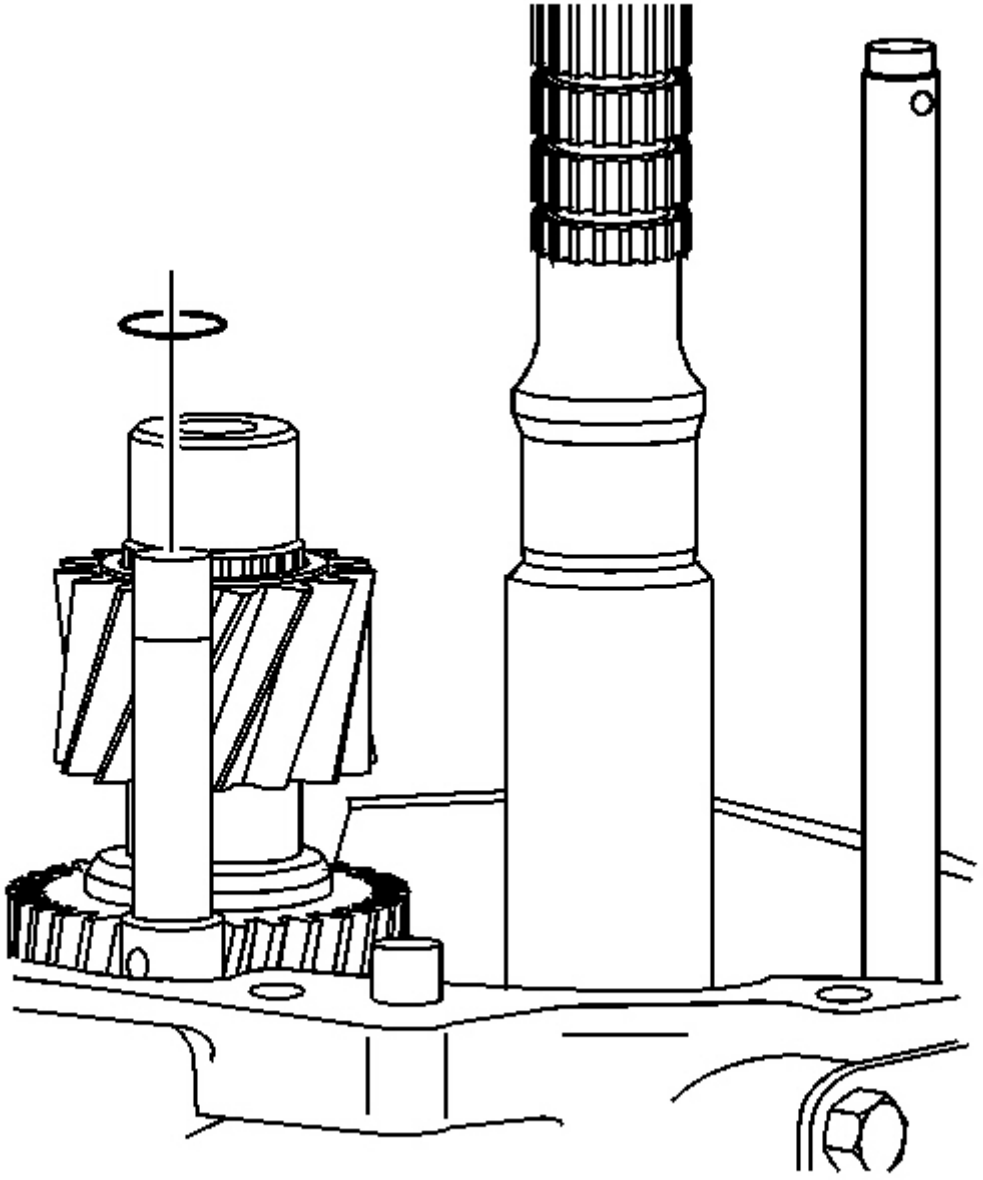


Fig. 373: View Of 5th/6th Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

13. Install the 5th/6th shift fork retainer ring.

5th/6th Speed Driven Gear Installation

Tools Required

- **J 39441** 5th/6th Driven Gear Installer. See **Special Tools**.
- **J 39441-10** 5th Gear Installer Adapter. See **Special Tools**.

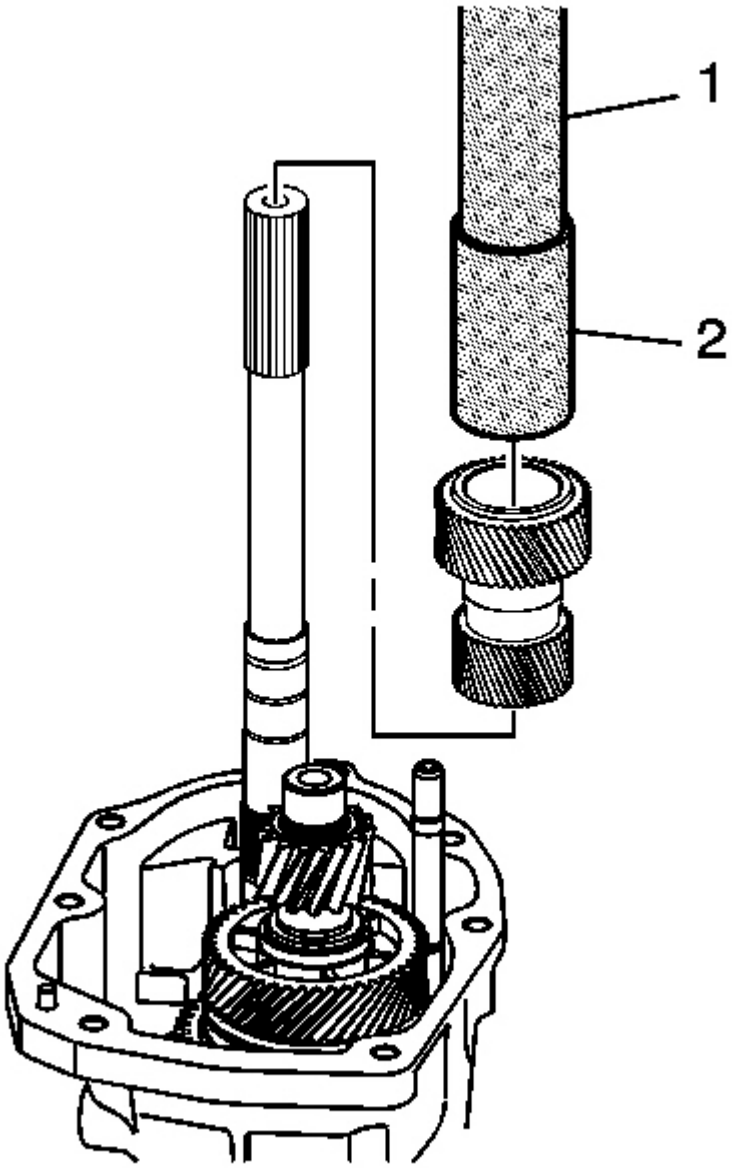


Fig. 374: View Of 5th/6th Speed Driven Gear & Special Tools
Courtesy of GENERAL MOTORS CORP.

1. Install the 5th/6th speed driven gear using the **J 39441** (1) and **J 39441-10** (2). See **Special Tools**. The smaller outside diameter (OD) of the gear faces down.

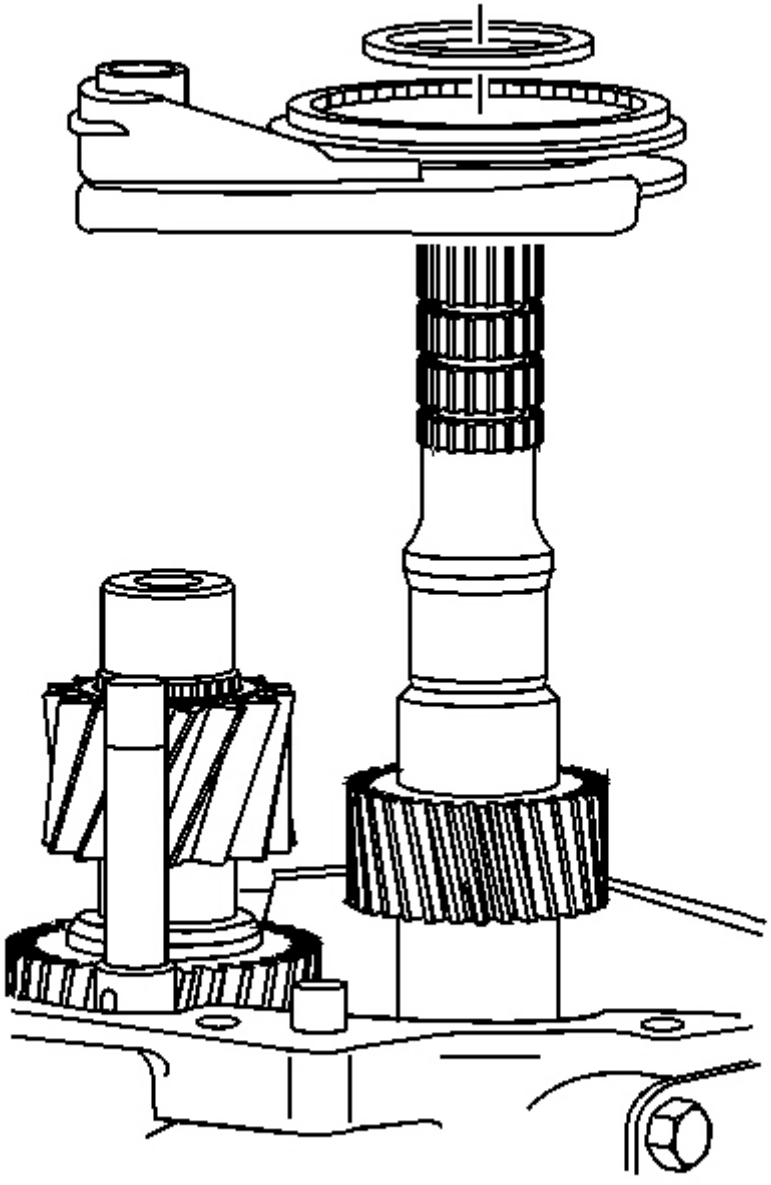


Fig. 375: View Of Thrust Washer, Reverse Synchronizer Assembly, Shift Fork & Retainer Ring
Courtesy of GENERAL MOTORS CORP.

2. Install the retainer clip, reverse shift fork, the synchronizer and the thrust washer.

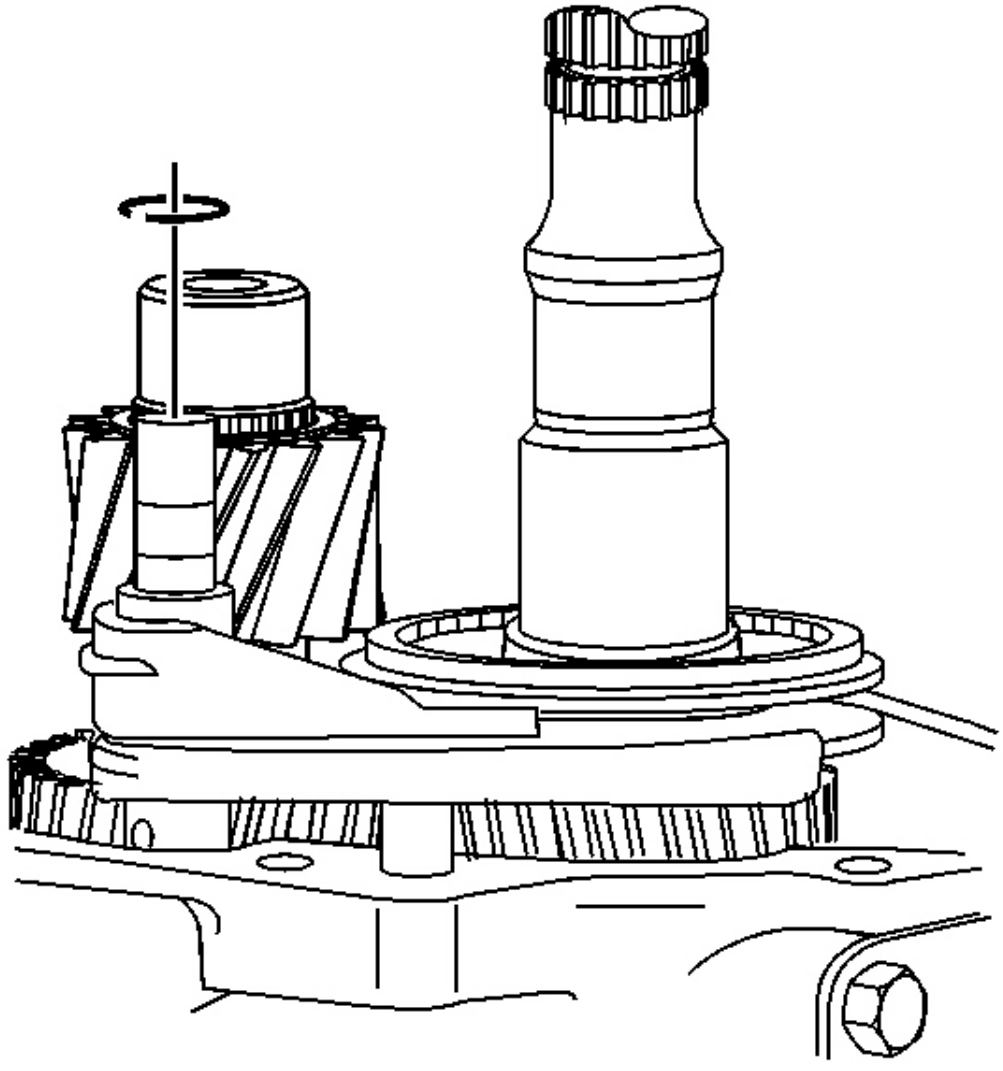


Fig. 376: View Of Reverse Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

3. Install a NEW shift fork retainer ring.

Reverse Shift Fork Installation

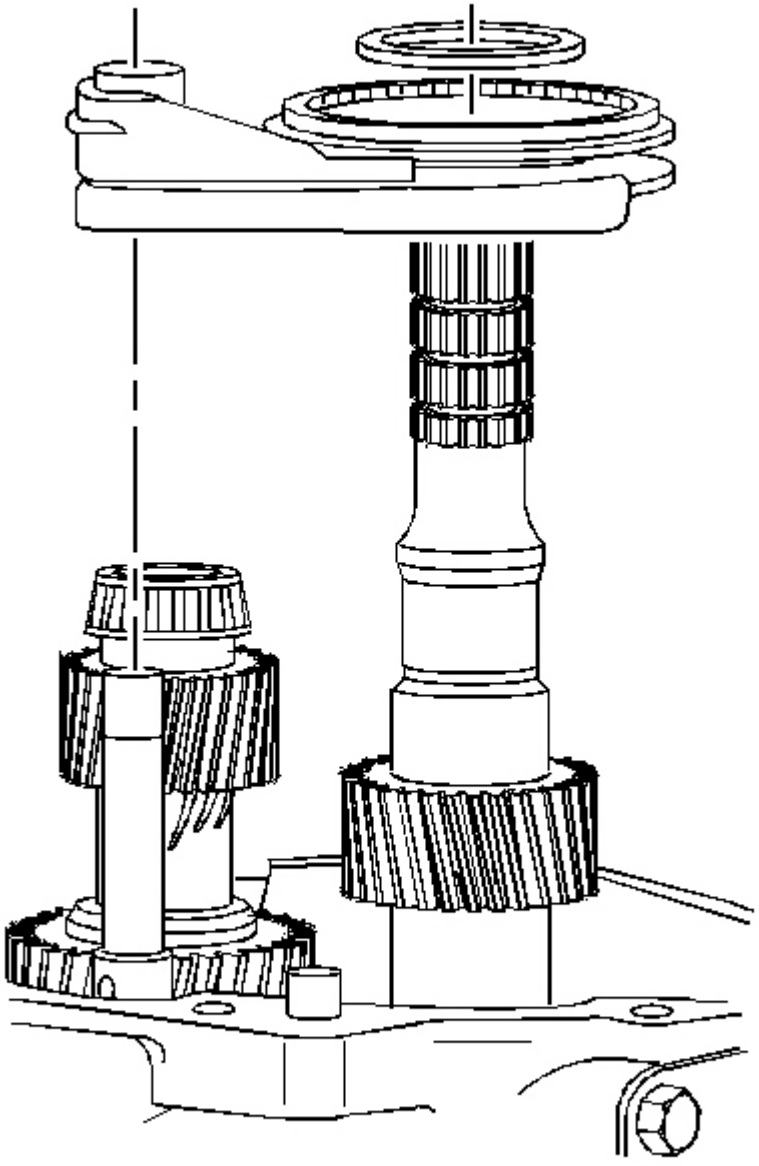


Fig. 377: Identifying Reverse Shift Fork, Synchronizer & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

1. Install the reverse shift fork, the synchronizer and the thrust washer.

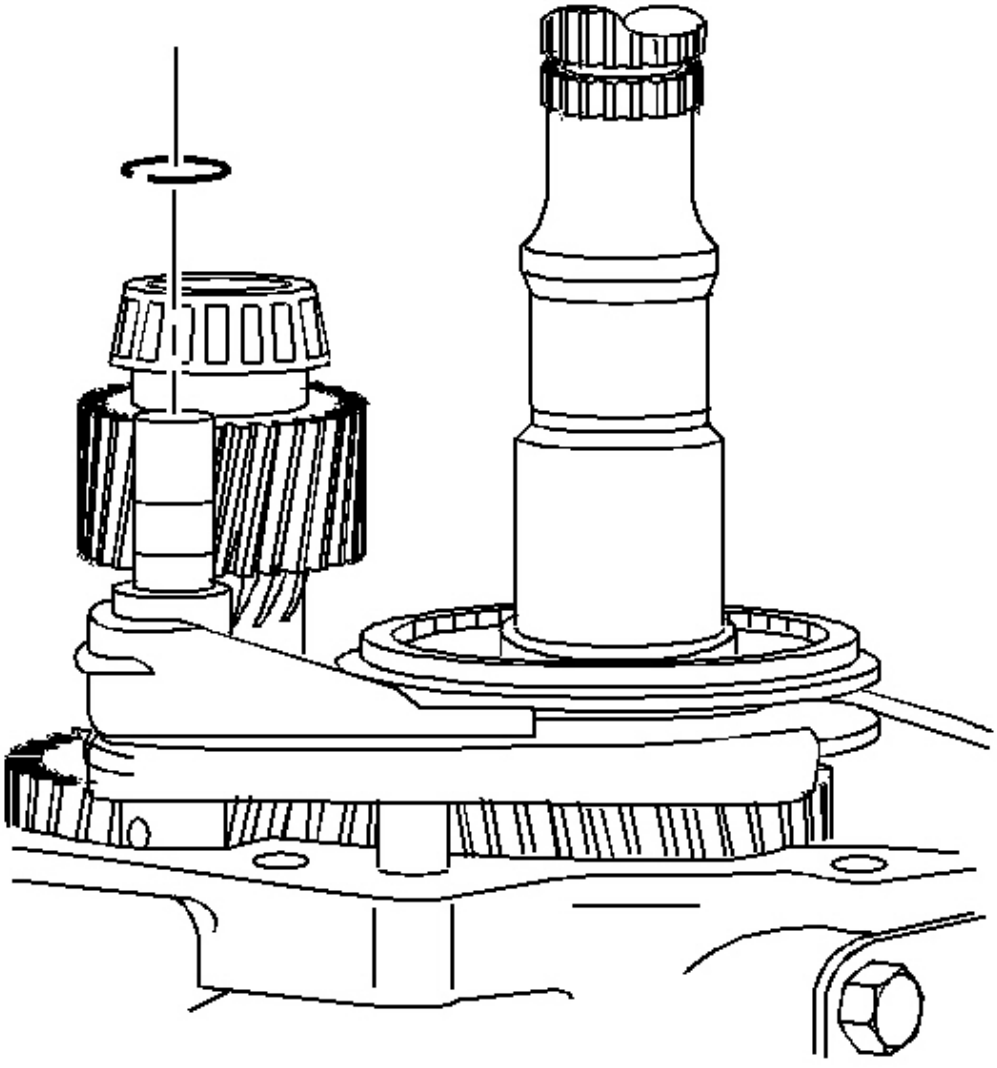


Fig. 378: View Of Reverse Shift Fork Retainer Ring
Courtesy of GENERAL MOTORS CORP.

2. Install a new shift fork retainer ring.

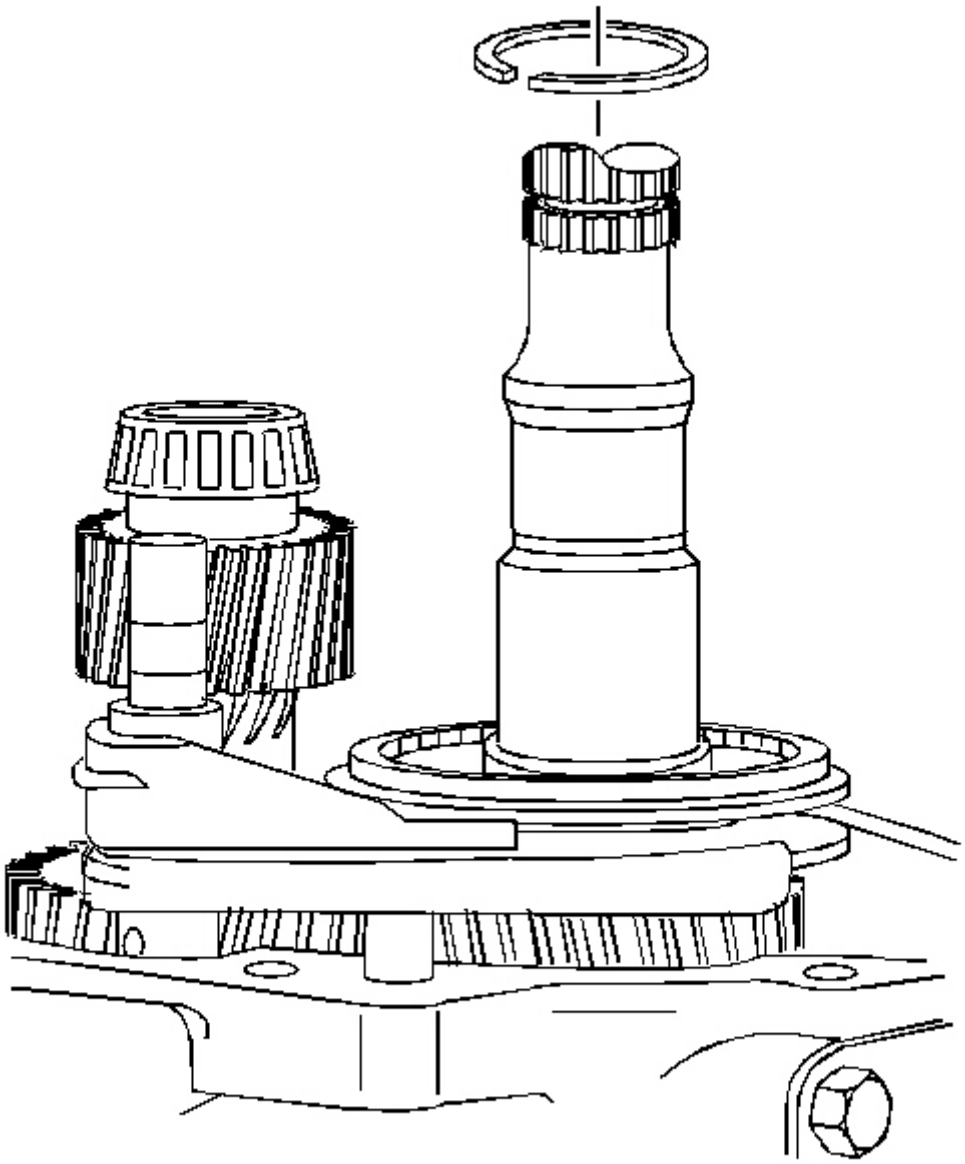


Fig. 379: View Of Reverse Synchronizer Retainer Ring
Courtesy of GENERAL MOTORS CORP.

3. Install the reverse synchronizer retainer ring.

Reverse Speed Gear Installation

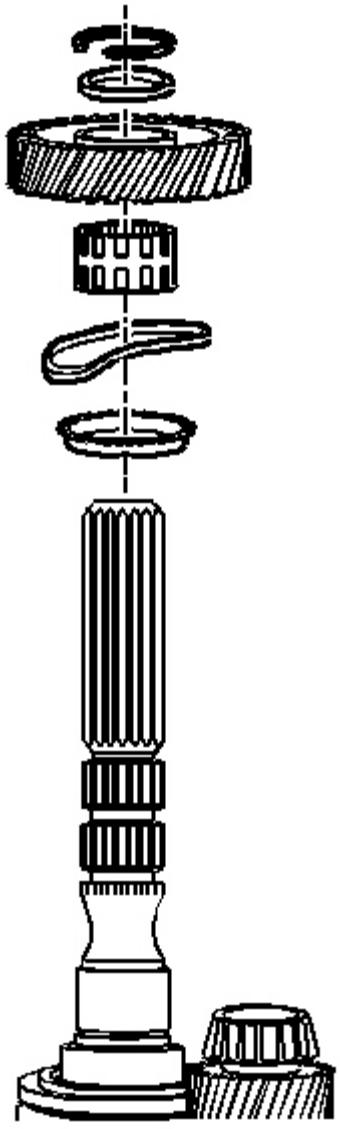


Fig. 380: Identifying Reverse Speed Gear Components
Courtesy of GENERAL MOTORS CORP.

1. Install the following parts in order:
    1. The blocking ring
    2. The wave washer

3. The wave washer so the concave side faces the blocking ring
4. The caged needle bearing
5. The reverse speed gear
6. The thrust washer
7. The retainer ring

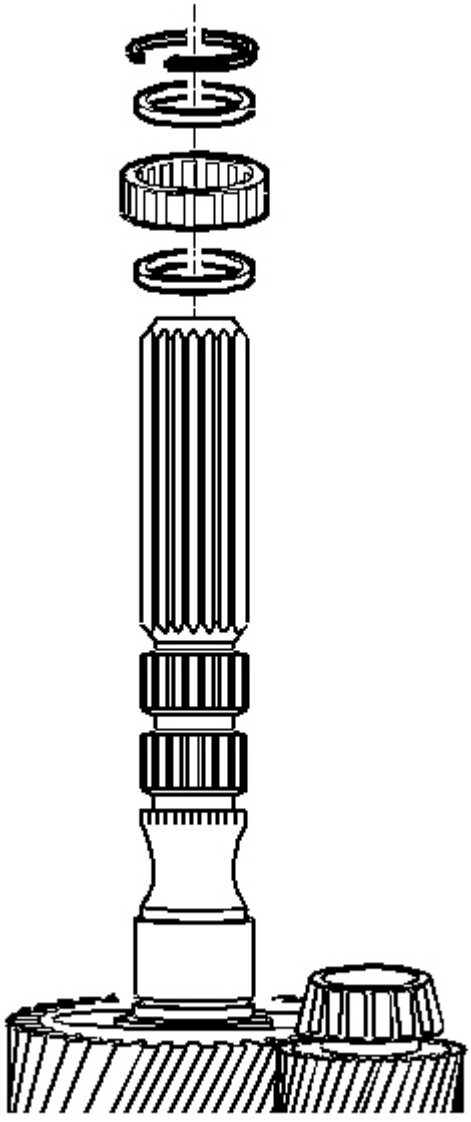


Fig. 381: View Of Mainshaft Rear Roller Bearing, Rear Bearing Retainer Ring & Spacers
Courtesy of GENERAL MOTORS CORP.

2. Install the following parts in order:
    1. The spacer
    2. The roller bearing
    3. The spacer
    4. The roller bearing retainer ring

Extension Housing Assemble

Tools Required

J 44395 Transmission Holding Fixture. See **Special Tools**.

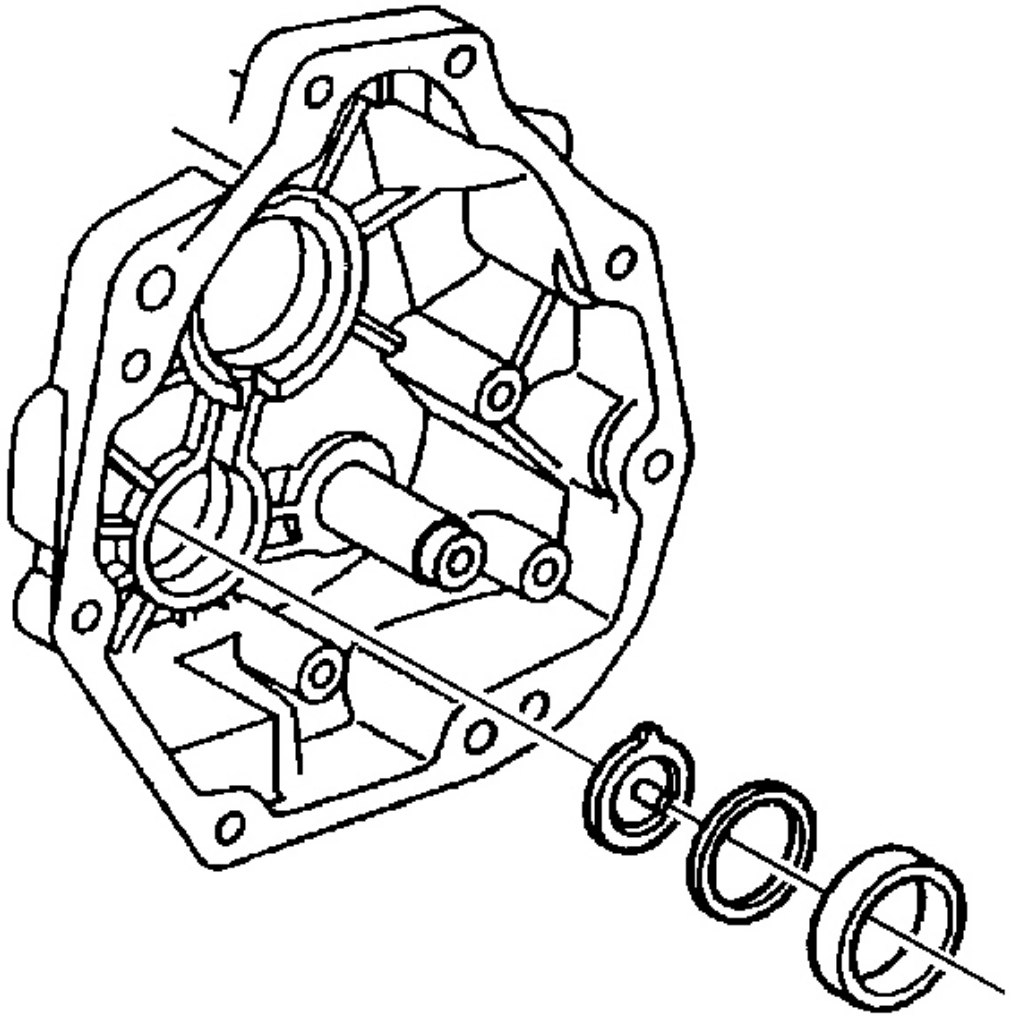


Fig. 382: View Of Countershaft Extension Bearing Race, Funnel & Shim
Courtesy of GENERAL MOTORS CORP.

1. Install the following parts in order:
    1. The funnel
    2. The selective shims. Refer to the Countershaft Extension in **Shimming Procedures**.
    3. The countershaft extension bearing race

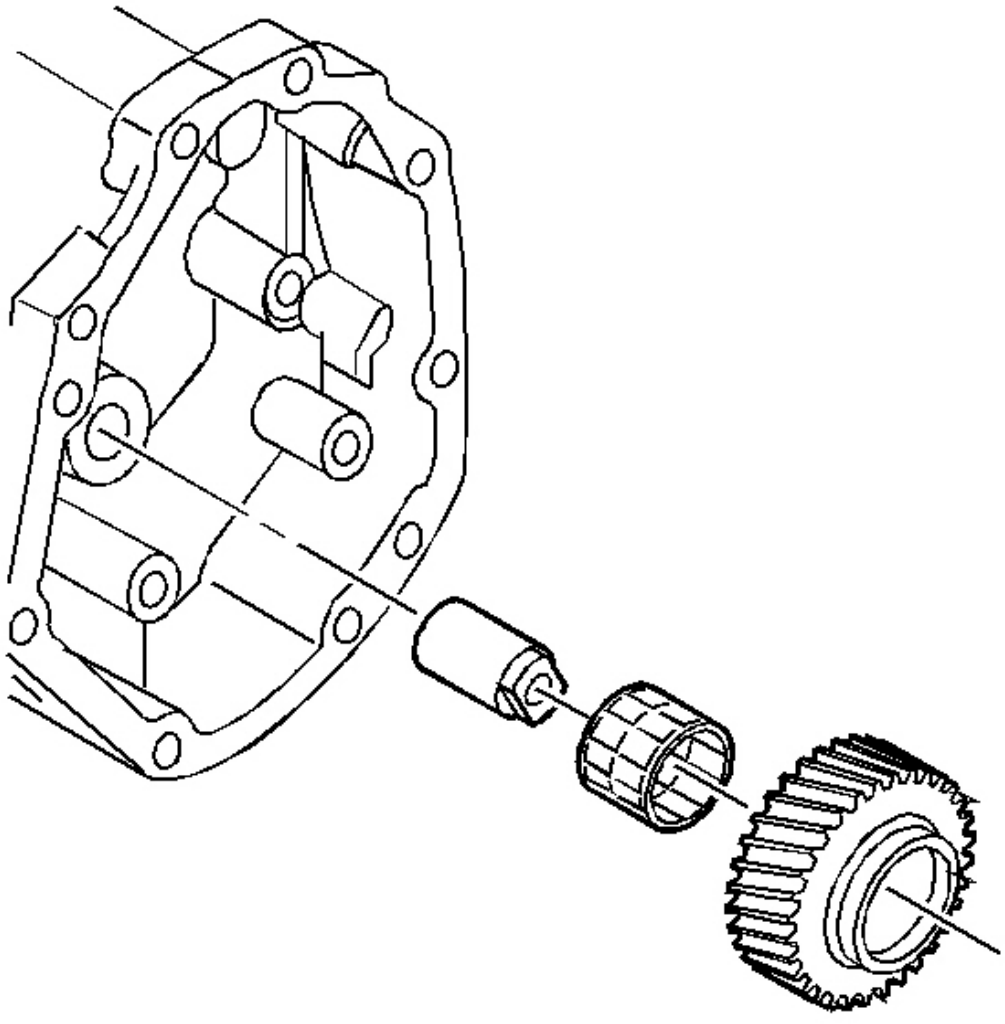


Fig. 383: Identifying Reverse Idler Shaft, Roller Bearing & Reverse Idler Gear
Courtesy of GENERAL MOTORS CORP.

2. Install the following parts in order:
    1. The reverse idler shaft
    2. The roller bearing
    3. The reverse idler gear

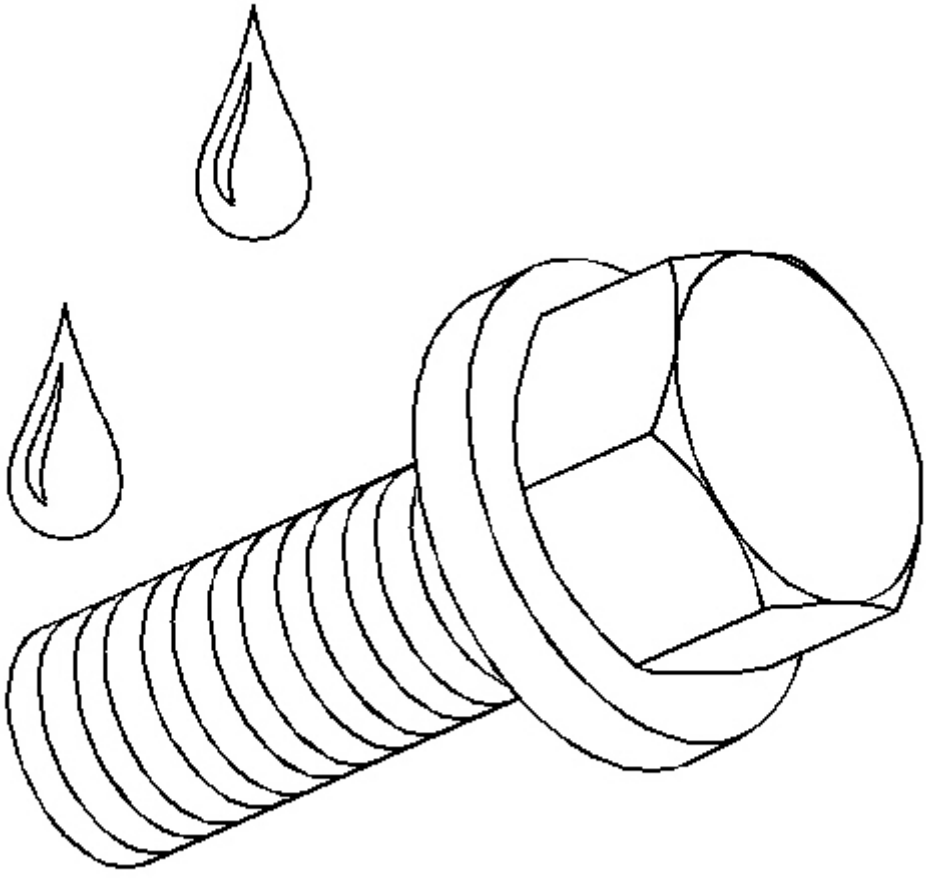


Fig. 384: Applying Sealant To Reverse Idler Shaft Brackets Bolt Threads
Courtesy of GENERAL MOTORS CORP.

3. Apply GM P/N 12345382 (Canadian P/N 10953489) or the equivalent to the reverse idler shaft brackets bolt threads.

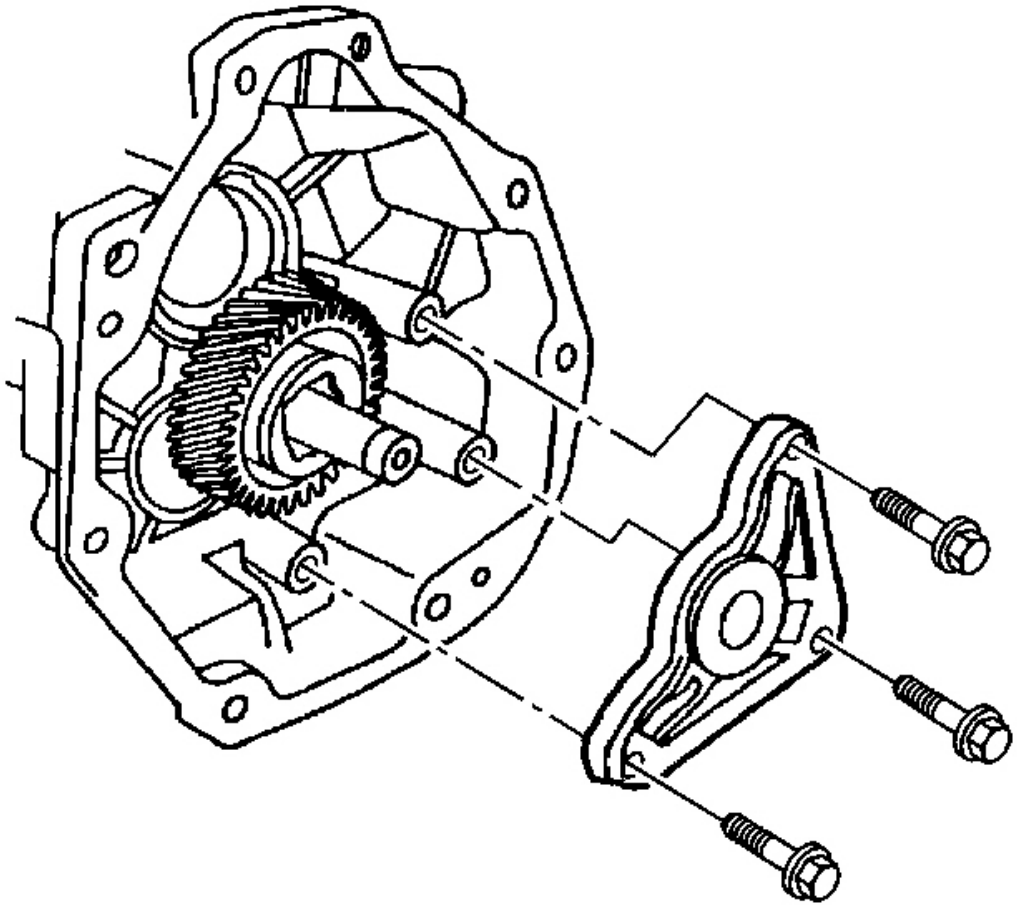


Fig. 385: View Of Reverse Idler Shaft Bracket & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

4. Install the following parts in order:
    1. The reverse idler shaft bracket
    2. The reverse idler shaft bracket bolts

    Tighten: Tighten the bolts to 25 N.m (18 Ib ft).

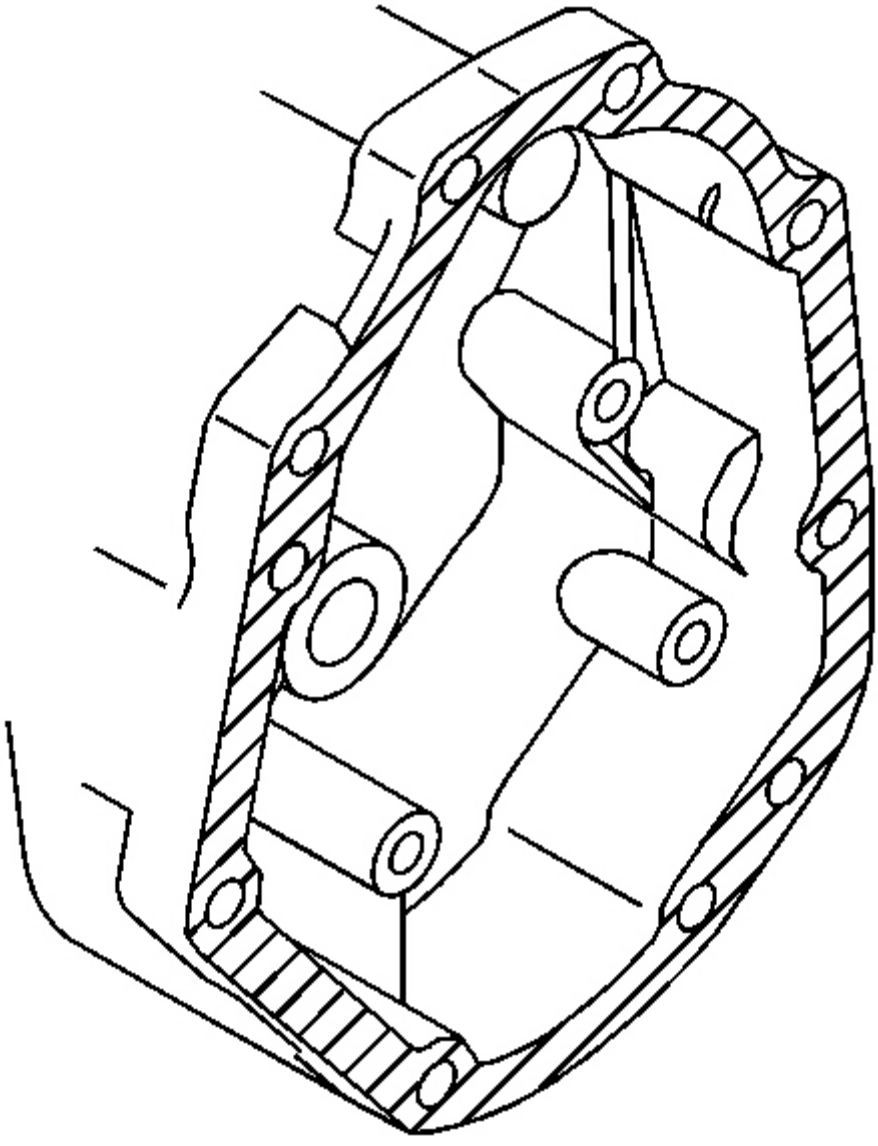


Fig. 386: View Of Transmission Case Mating Surface
Courtesy of GENERAL MOTORS CORP.

5. Install a new gasket GM P/N 89059570 on the extension housing to the transmission case mating surface.

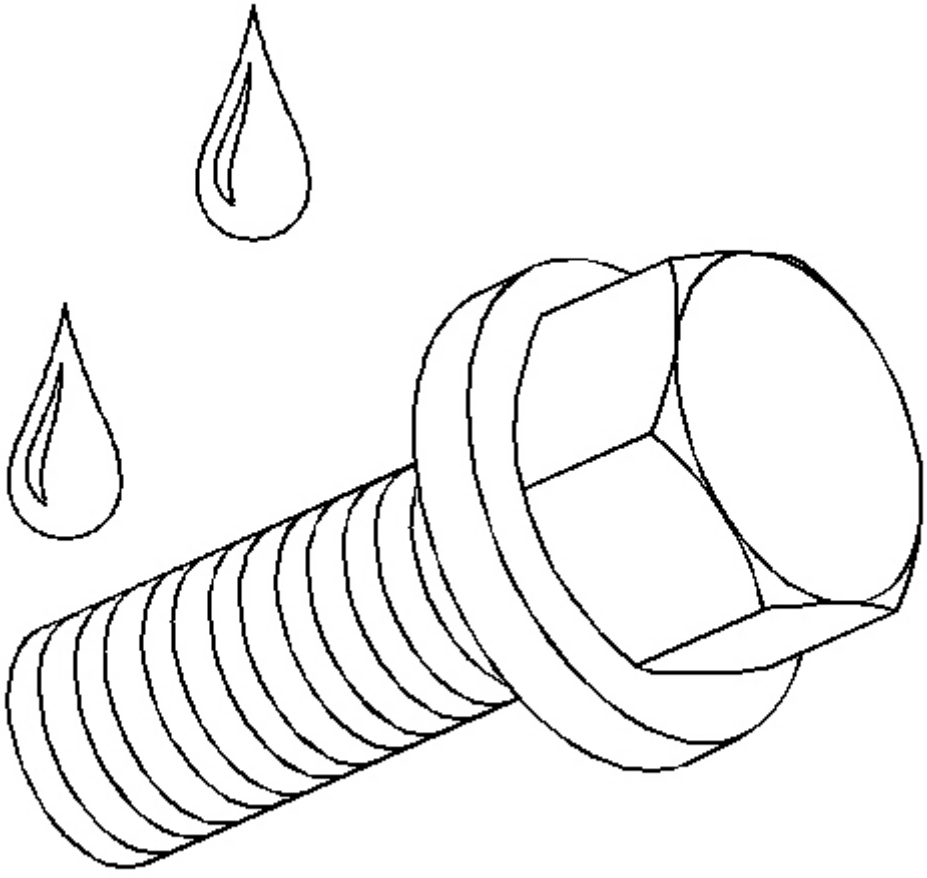


Fig. 387: Applying Sealant To Reverse Idler Shaft Brackets Bolt Threads
Courtesy of GENERAL MOTORS CORP.

6. Apply thread sealer GM P/N 12346004 (Canadian P/N 10953480) or equivalent to the top 2 extension housing bolts.

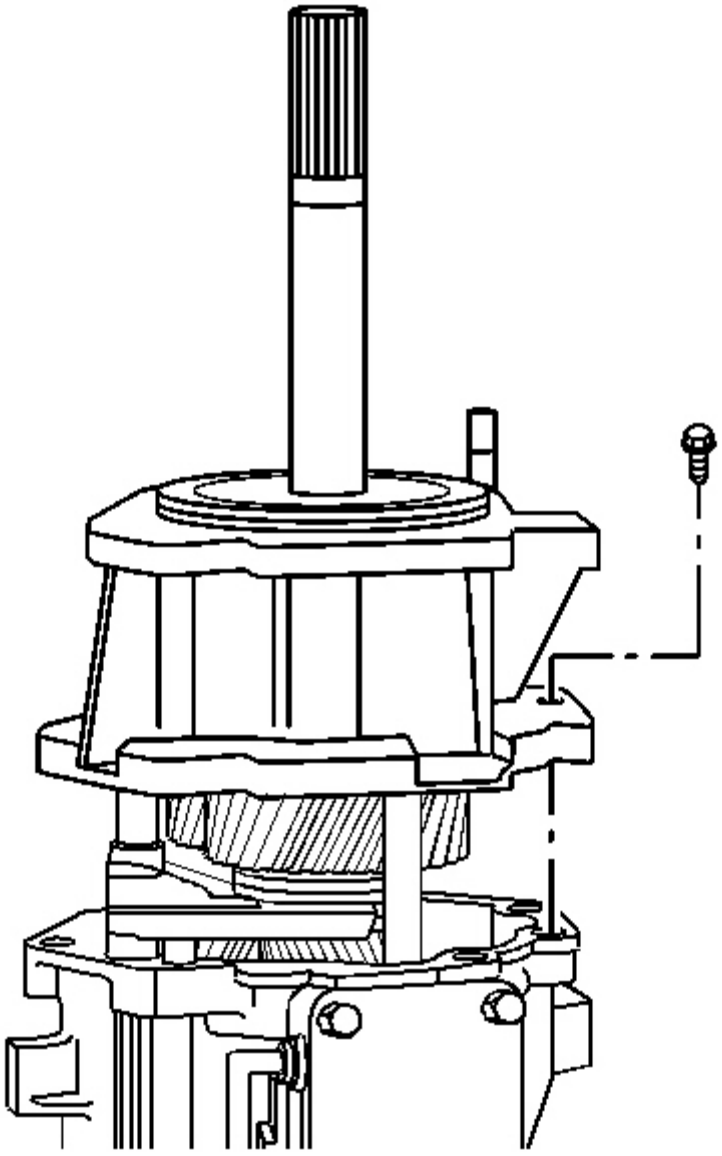


Fig. 388: View Of Extension Housing Bolts & Extension Housing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Align the 5th/6th shift shaft to the extension housing bore in order to install the extension housing.

7. Install the extension housing.
8. Install the extension housing bolts.

   Tighten: Tighten the bolts to 48 N.m (36 lb ft).

9. Install the vent tube.

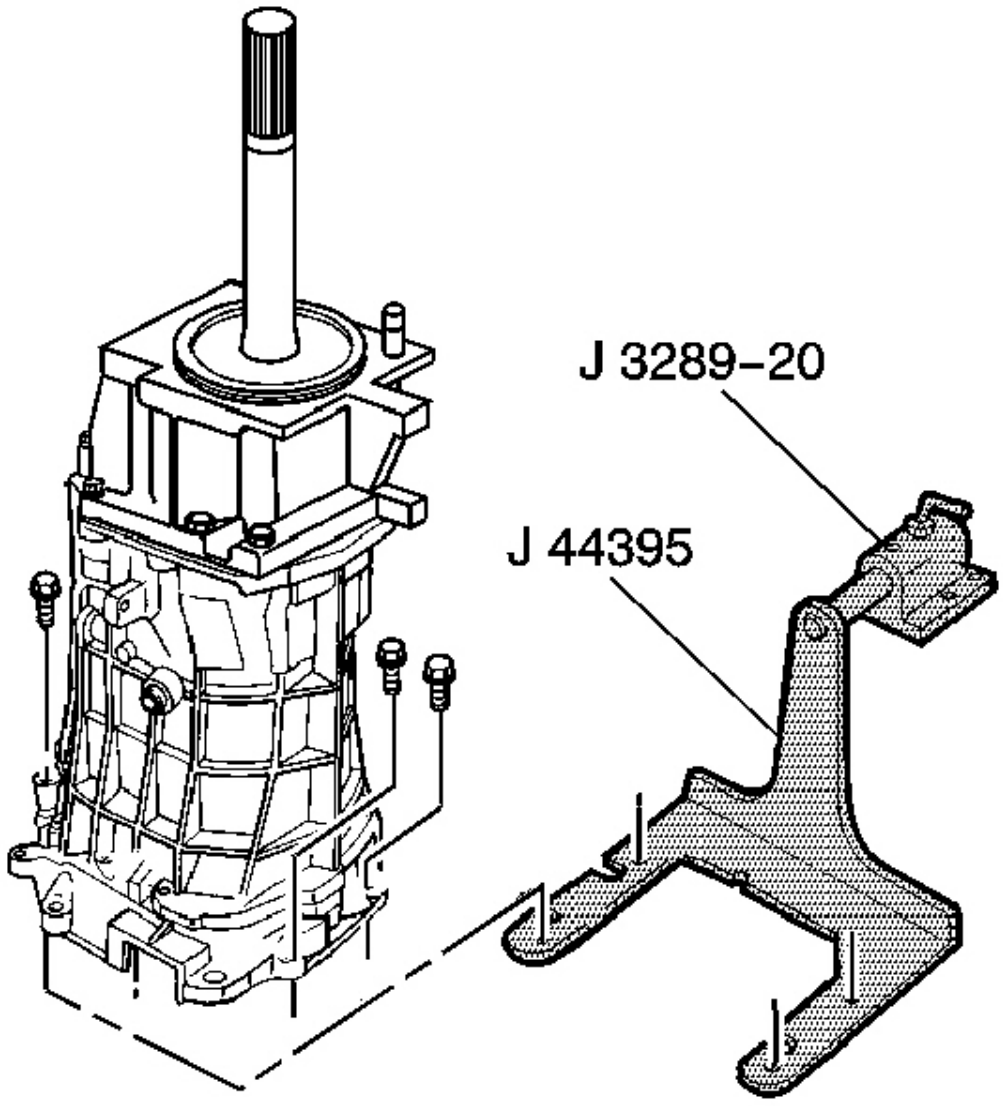


Fig. 389: View Of J 44395 & J 3289-20 With Transmission Case
Courtesy of GENERAL MOTORS CORP.

10. Remove the **J 44395** . See **Special Tools**.

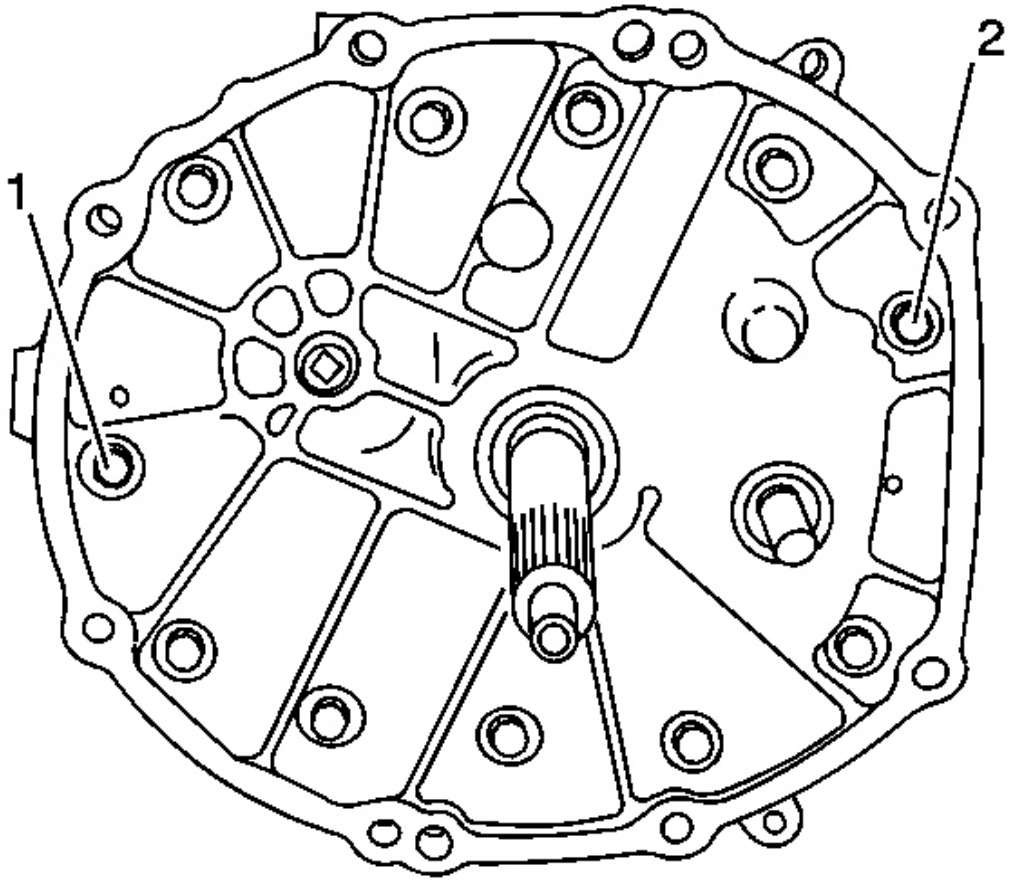


Fig. 390: View Of Adapter Plate Bolts
Courtesy of GENERAL MOTORS CORP.

11. Install the remaining 2 adapter plate bolts (1) and (2).

Tighten: Tighten the adapter plate bolts to 48 N.m (36 lb ft).

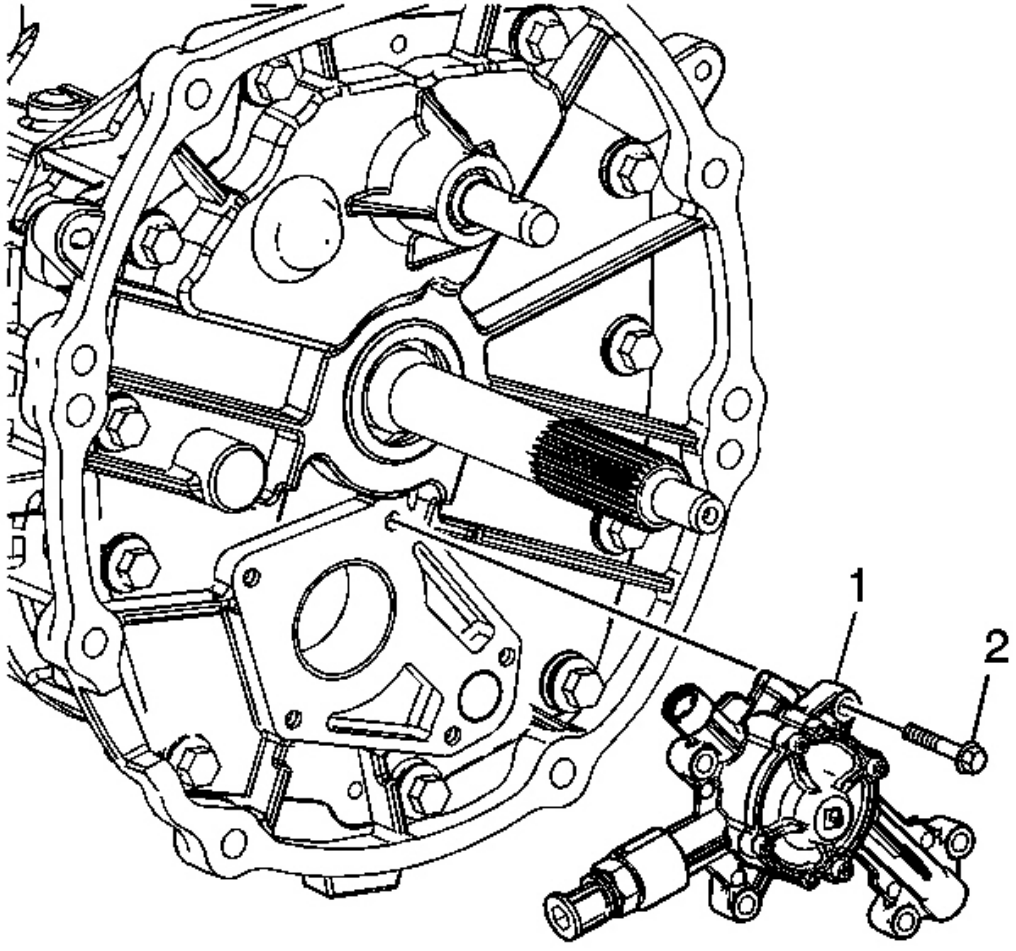


Fig. 391: View Of Auxiliary Coolant Pump & Bolt
Courtesy of GENERAL MOTORS CORP.

12. Install the auxiliary coolant pump (1) (MY6 only).
13. Install the auxiliary coolant pump bolt (2) (MY6 only).

Tighten: Tighten the bolt to 19 N.m (14 lb ft).

SHIMMING PROCEDURES

Input Shaft, Mainshaft, and Countershaft

Tools Required

- **J 8001** Dial Indicator Set
- **J 39444-1** Countershaft End Play Rod. See **Special Tools**.

1. Rotate the transmission adapter plate to the vertical position.

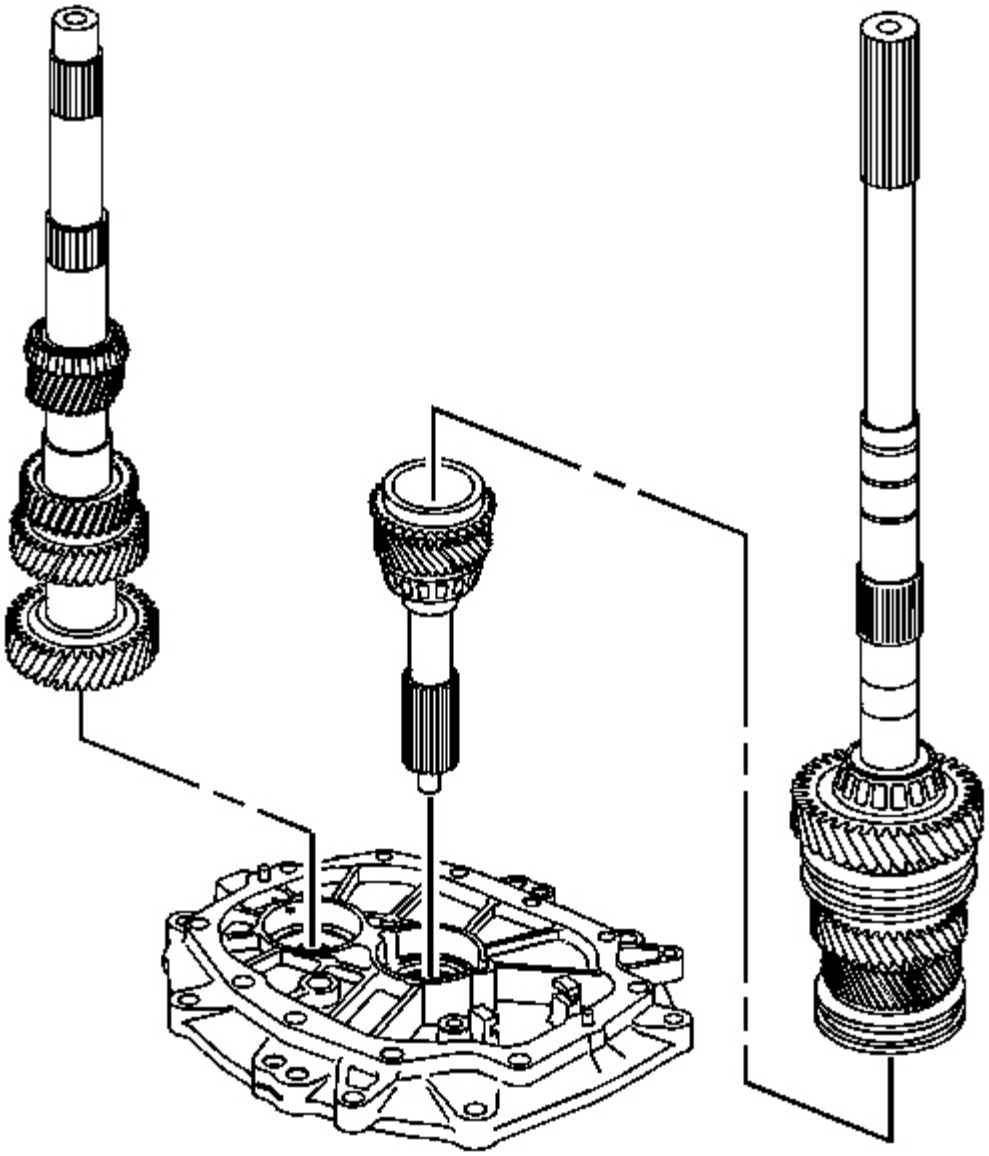


Fig. 392: View Of Input Shaft, Adapter Plate, Blocking Ring, Mainshaft Assembly & Countershaft
Courtesy of GENERAL MOTORS CORP.

2. Install the following assemblies in order:

1. The input shaft to the adapter plate
2. Align the 4th speed gear blocking ring to the input shaft.
3. The mainshaft assembly
4. The countershaft (lift up the mainshaft enough to install the countershaft.)

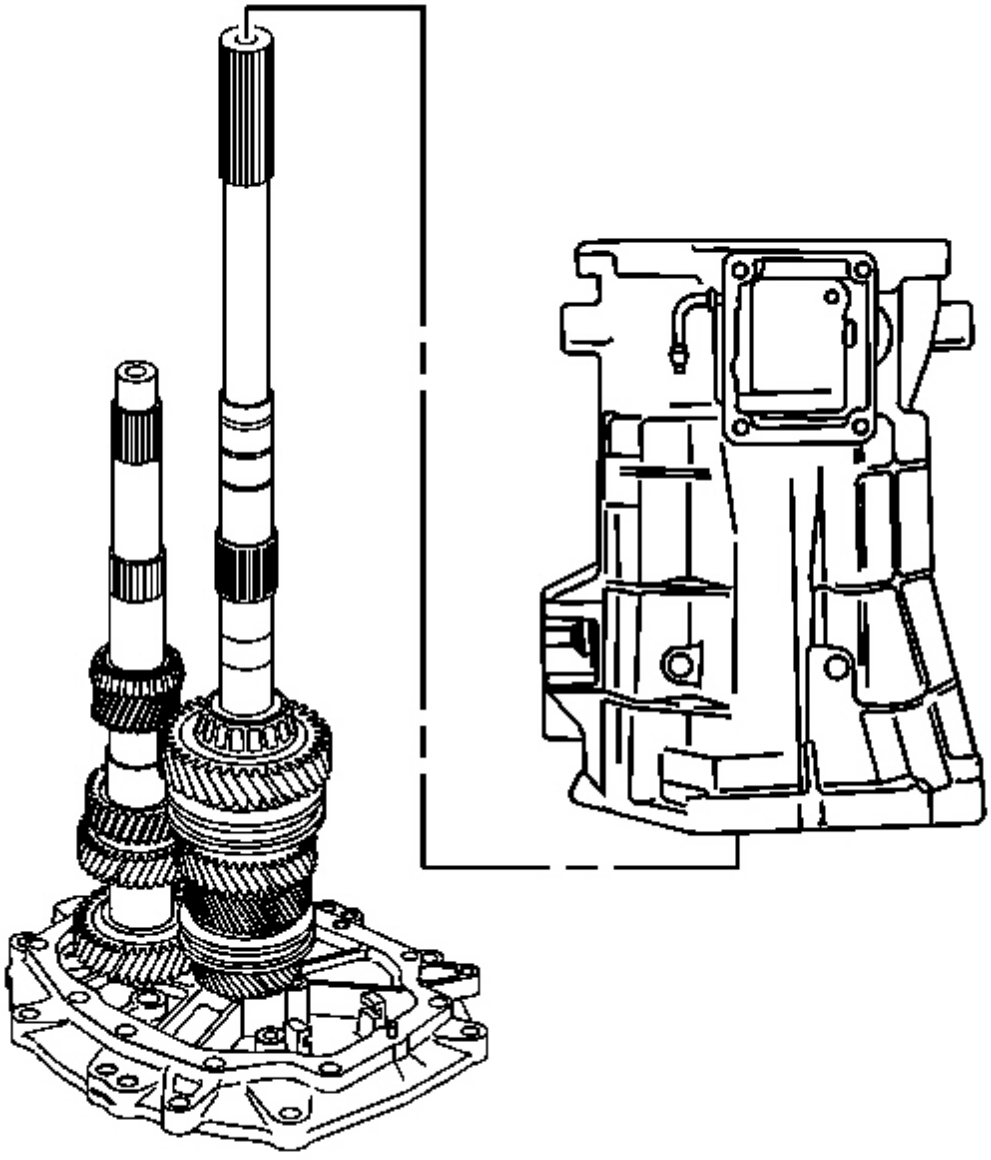


Fig. 393: View Of Countershaft & Transmission Case
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission case.

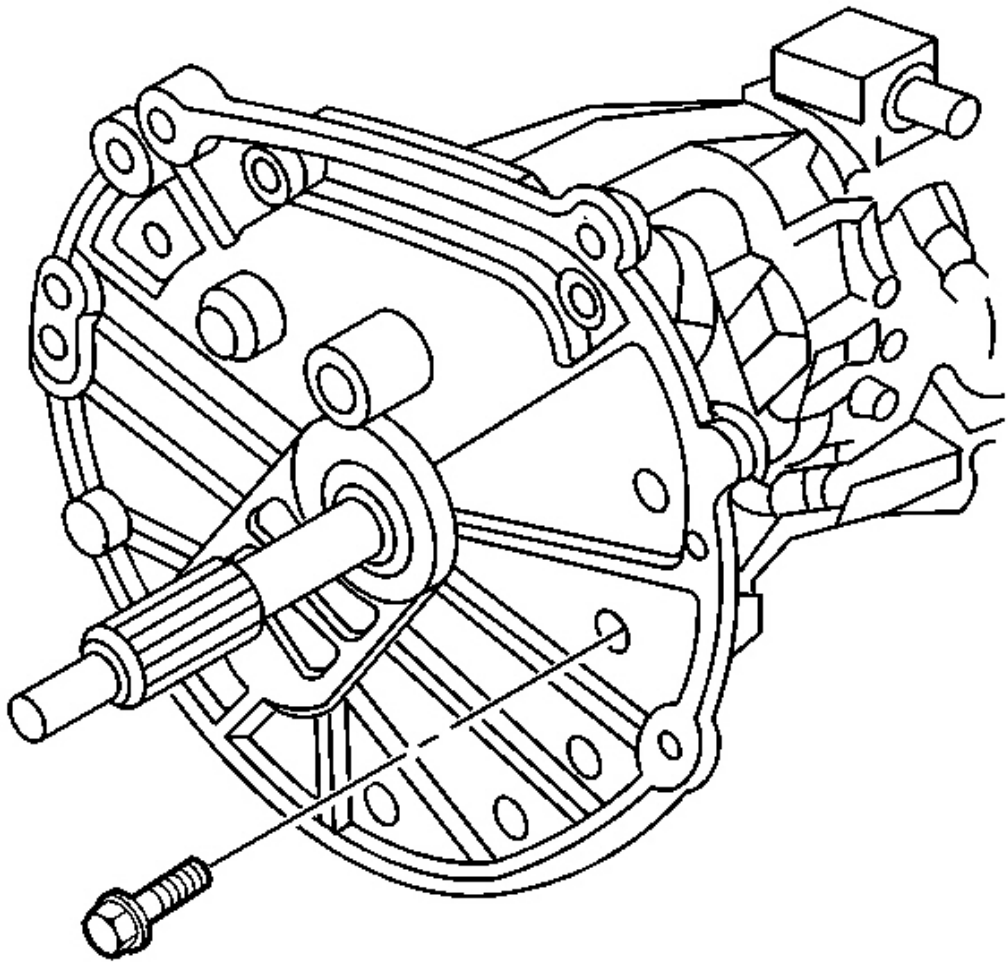


Fig. 394: View Of Adapter Plate & Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

4. Install the adapter plate to transmission case bolts.

Tighten: Tighten the bolts to 36 N.m (27 lb ft).

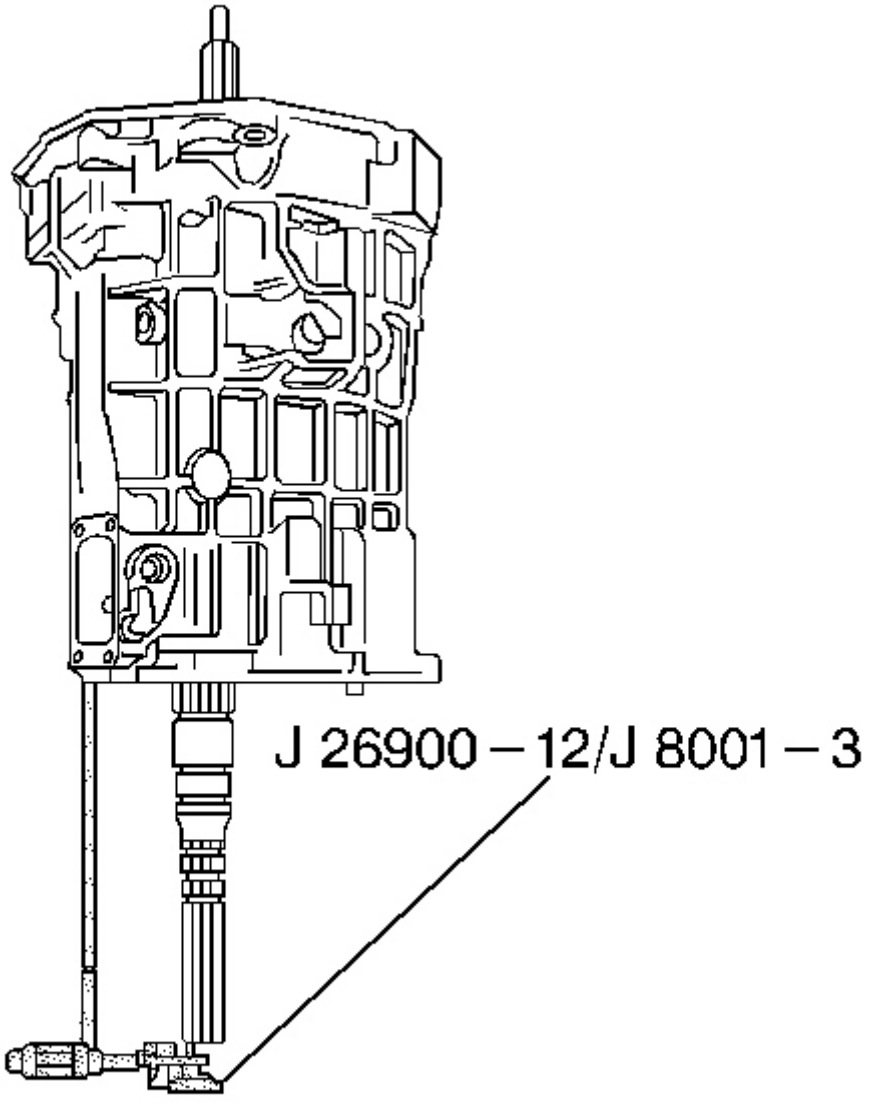


Fig. 395: Measuring Input Shaft/Mainshaft End Play Using J 8001-3
Courtesy of GENERAL MOTORS CORP.

5. Measure the input shaft/mainshaft end play using the following procedure:
    1. Place the tip of the **J 8001** -3 on the end of the mainshaft.

2. Move the input shaft up and down.
3. Record the measurement.

6. Select a shim to achieve 0.00-0.05 mm (0.000-0.002 in) preload.
7. Remove the **J 8001** -3.

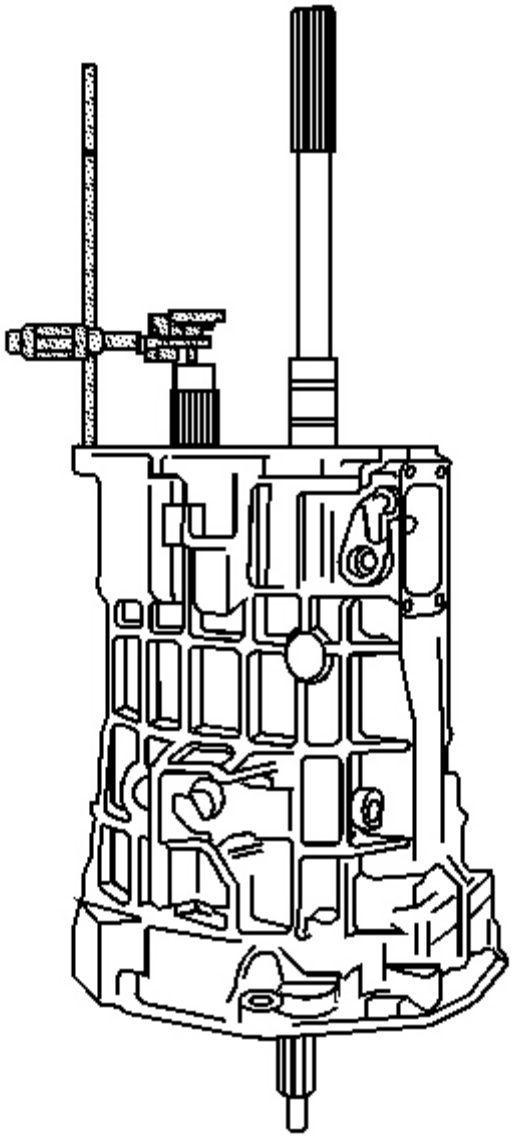


Fig. 396: View Of Special Tool On The End Of Countershaft
Courtesy of GENERAL MOTORS CORP.

8. Measure the countershaft end play using the following procedure:
    1. Place the tip of the **J 8001** -3 on the end of the countershaft.
    2. Move the countershaft up and down.
    3. Record the measurement.
9. Select a shim to achieve 0.00-0.05 mm (0.000-0.002 in) preload.
10. Remove the **J 8001** -3.

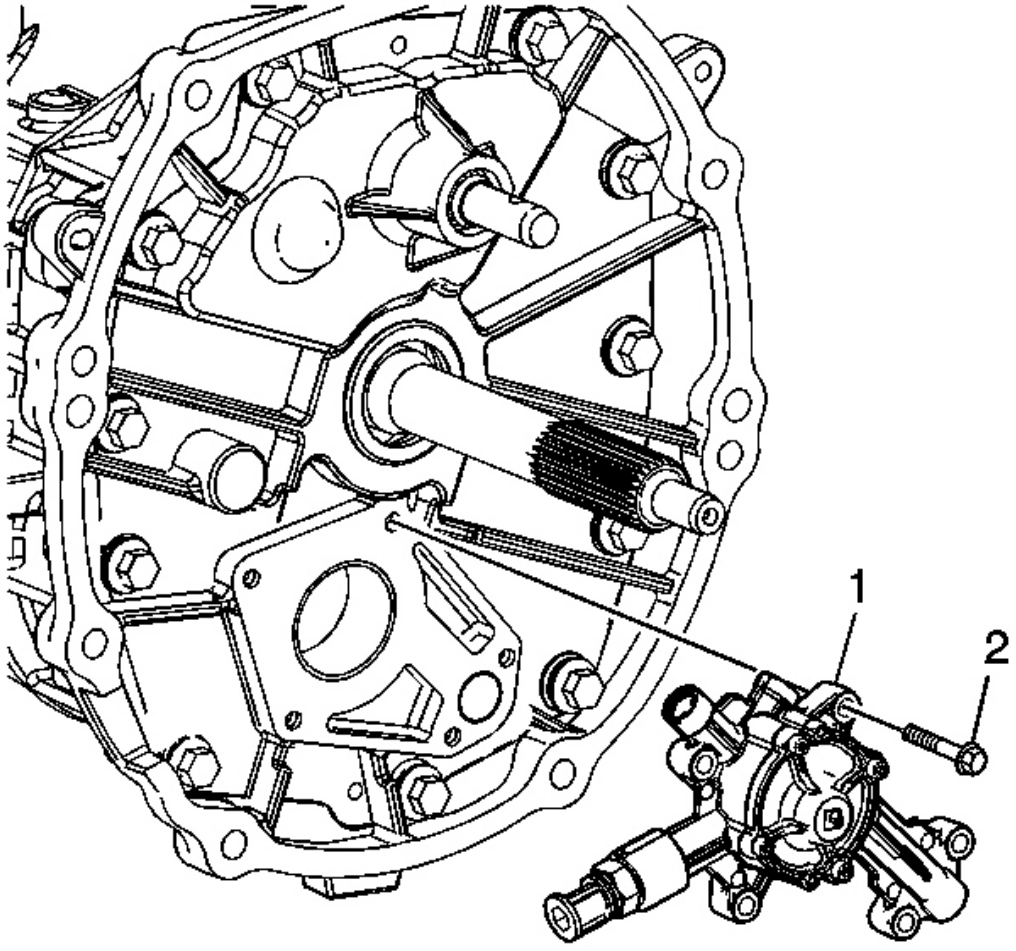


Fig. 397: View Of Auxiliary Coolant Pump & Bolt

Courtesy of GENERAL MOTORS CORP.

11. Remove the adapter plate plug (MM6 only).
12. Remove the auxiliary coolant pump bolt (2) (MY6 only).
13. Remove the auxiliary coolant pump (1) (MY6 only).

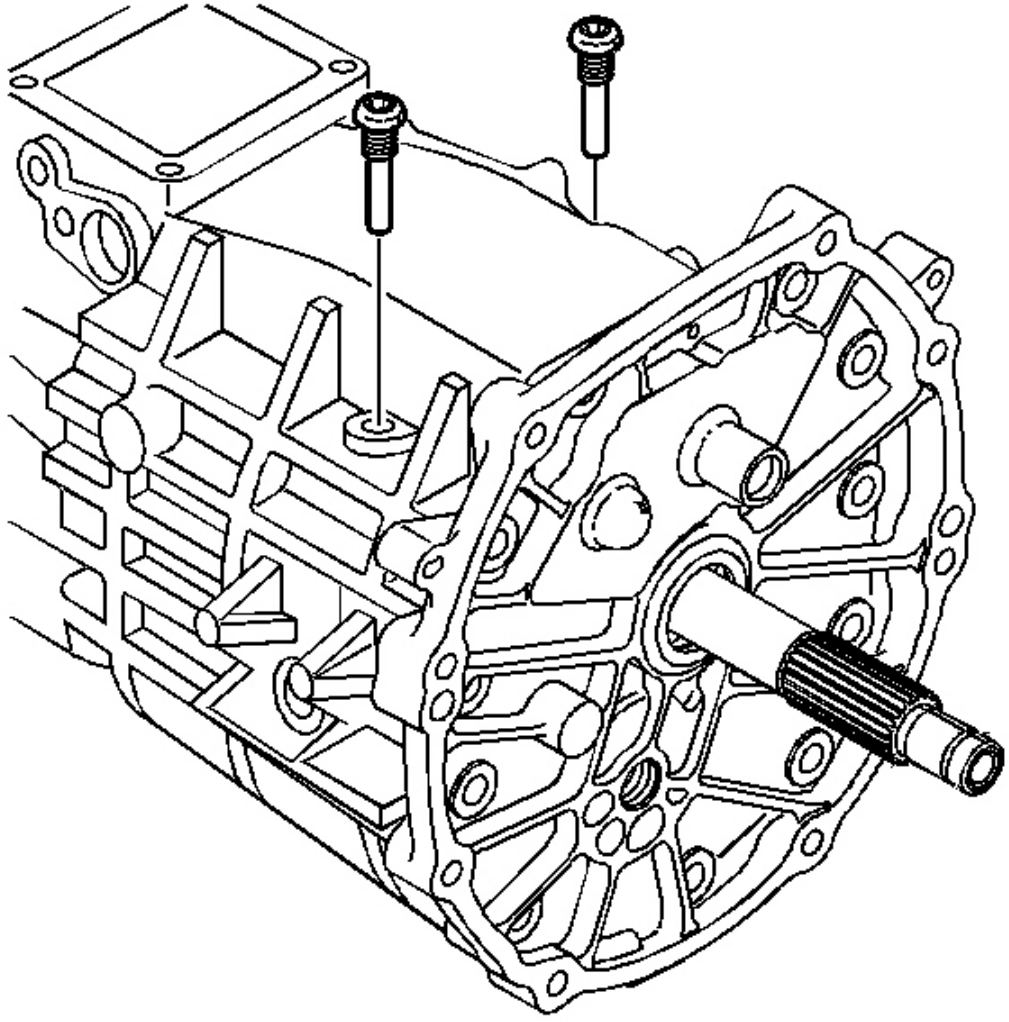


Fig. 398: Locating Shift Lever Guide Bolts
Courtesy of GENERAL MOTORS CORP.

14. Remove the shift lever guide bolts.

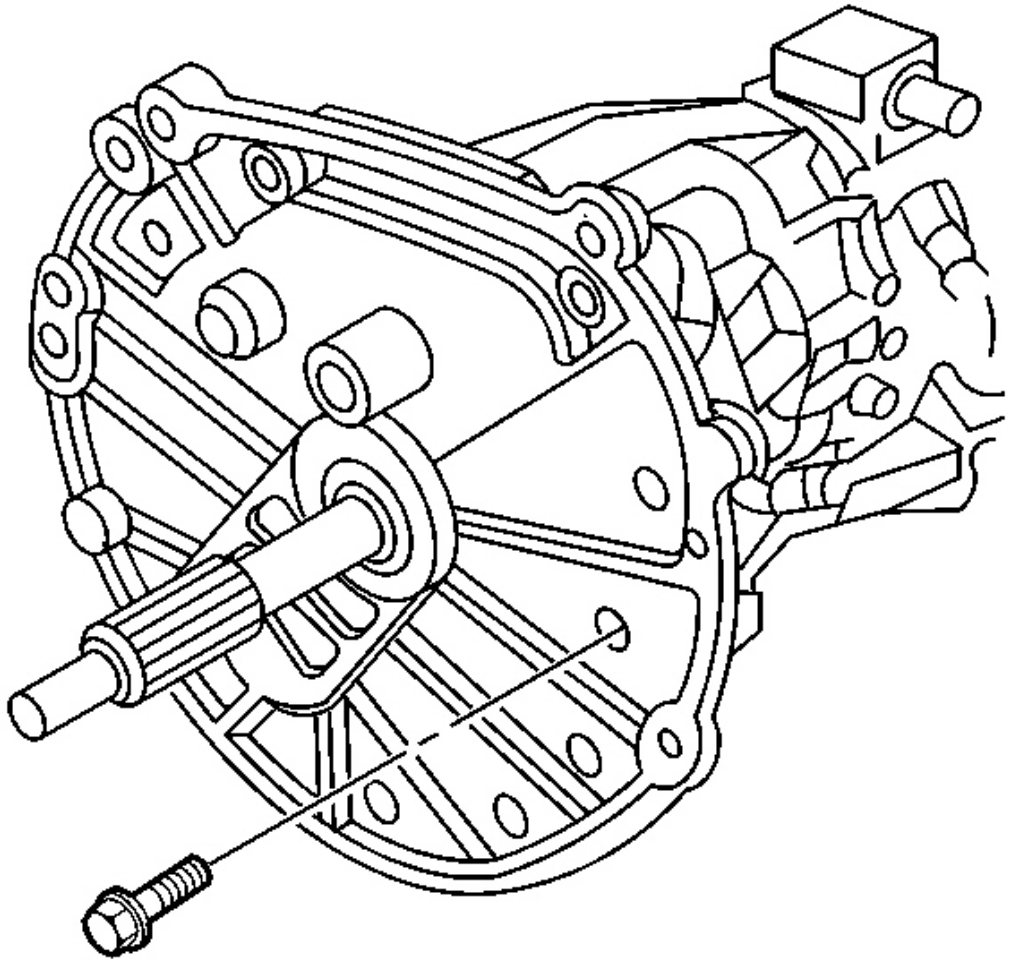


Fig. 399: View Of Adapter Plate & Transmission Case Bolts
Courtesy of GENERAL MOTORS CORP.

15. Remove the adapter plate to the transmission case bolts.

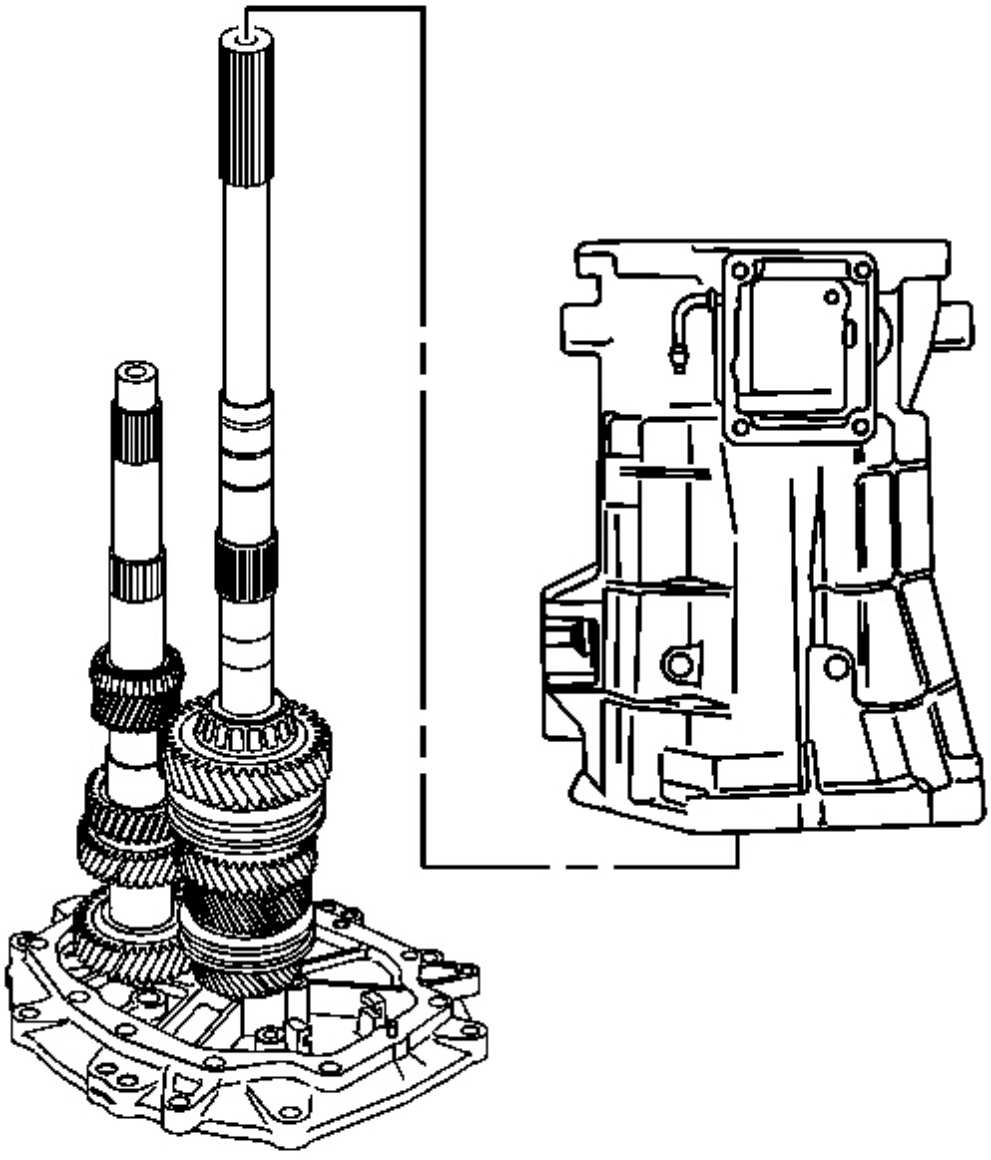


Fig. 400: View Of Transmission Case & Countershaft
Courtesy of GENERAL MOTORS CORP.

16. Remove the transmission case.

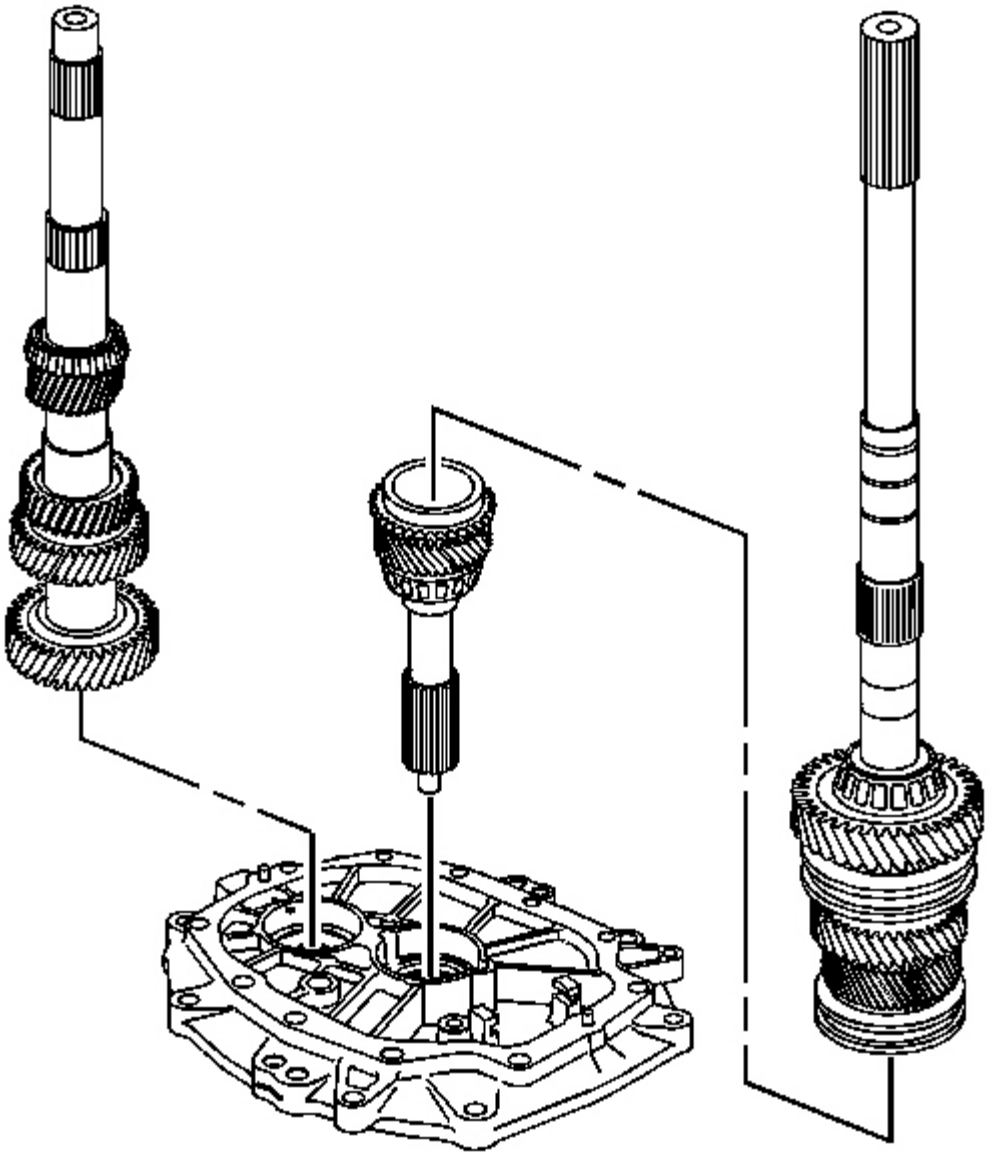


Fig. 401: View Of Countershaft, Mainshaft Assembly, Input Shaft, Adapter Plate, Input Shaft Bearing Race & Countershaft Bearing Race
Courtesy of GENERAL MOTORS CORP.

17. Remove the following parts in order:

1. The countershaft (lift up the mainshaft enough to remove the countershaft).
2. The mainshaft assembly
3. The input shaft from the adapter plate
4. The input shaft bearing race
5. The countershaft bearing race

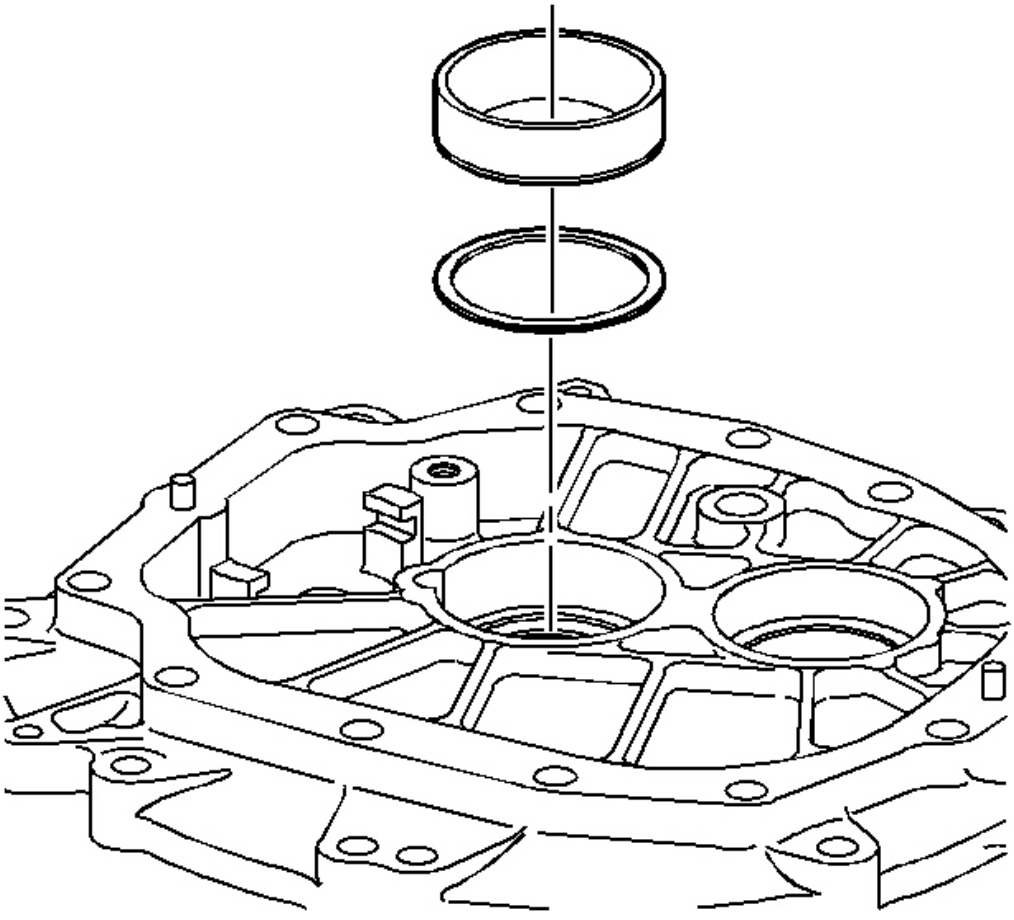


Fig. 402: View Of Input Shaft Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

18. Remove the input shaft bearing race.
19. Remove the input shaft bearing shim and discard.

20. Install the new input shaft bearing shim, and the original bearing race.

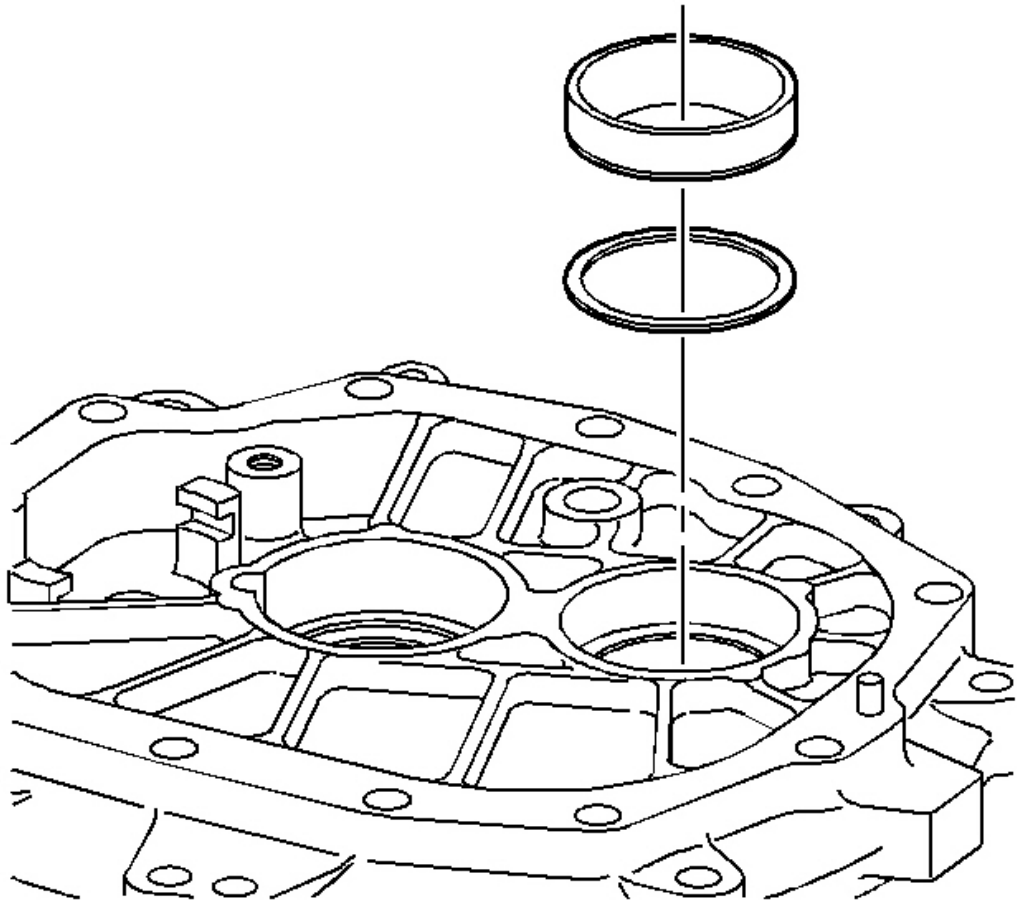


Fig. 403: Identifying Countershaft Bearing Shim & Bearing Race
Courtesy of GENERAL MOTORS CORP.

21. Remove the countershaft bearing race.
22. Remove the countershaft bearing shim and discard.
23. Install the new input shaft bearing shim, and the original bearing race.
24. Refer to **Transmission Assemble (Z06)**.

Countershaft Extension

Tools Required

- **J 8001** Dial Indicator Set
- **J 39444-2** Countershaft Extension End Play Rod. See **Special Tools**.

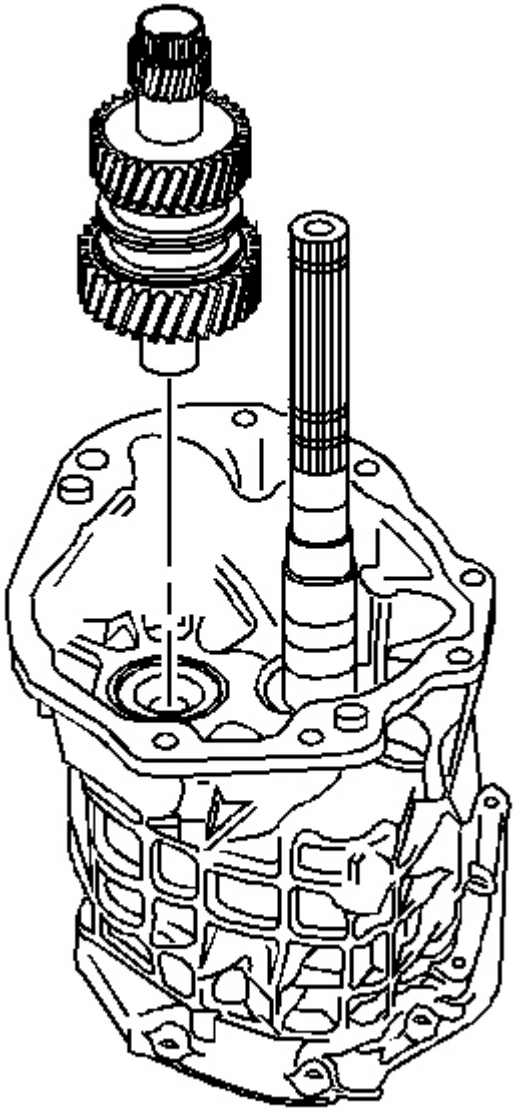


Fig. 404: Identifying Countershaft Extension
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The following procedure cannot be performed accurately until the countershaft shimming procedure has been completed and the transmission has been assembled to the point of installing the countershaft extension.

1. Rotate the transmission in the horizontal position.
2. Install the countershaft extension to the countershaft. Make sure the splines fully engage.

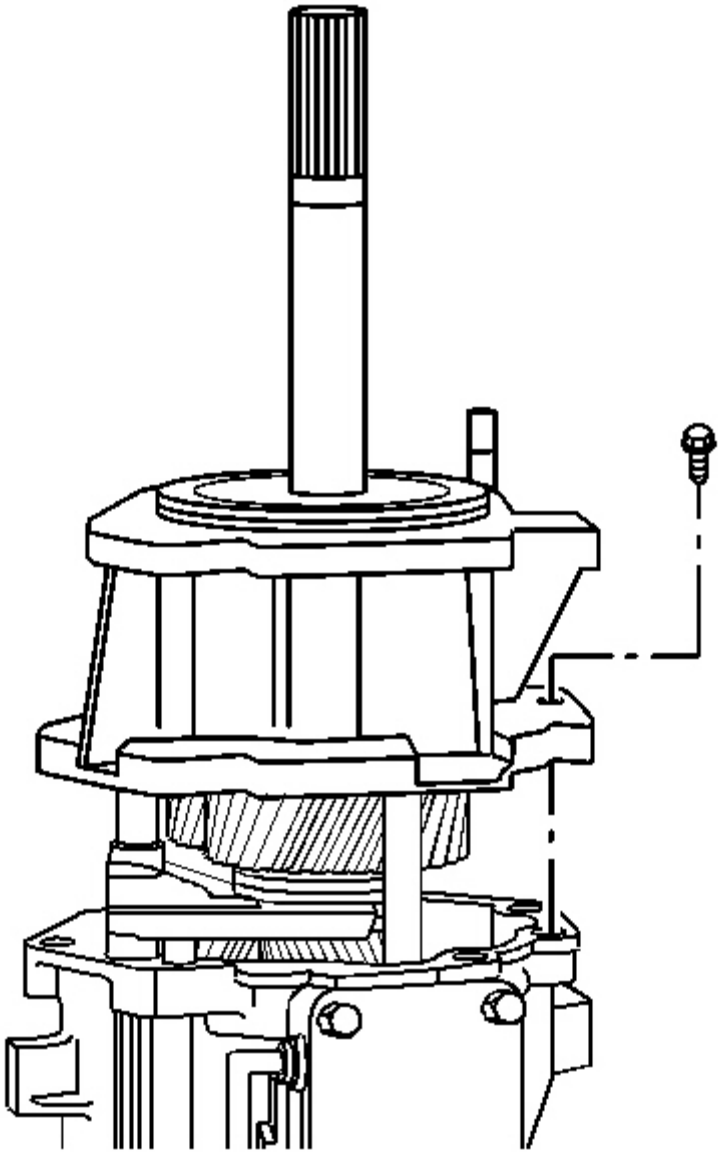


Fig. 405: View Of Extension Housing Bolts & Extension Housing
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

3. Install the extension housing and the extension housing retainer bolts.

Tighten: Tighten the bolts to 35 N.m (26 Ib ft).

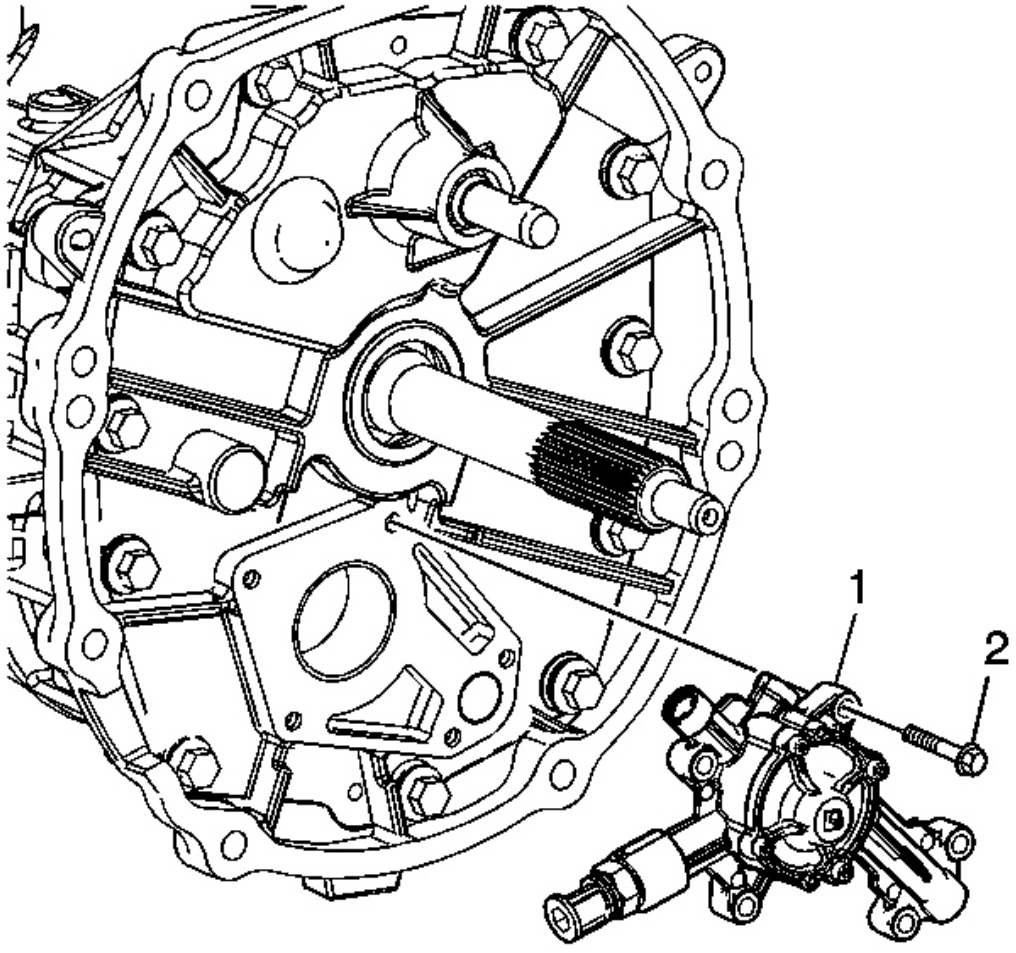


Fig. 406: View Of Auxiliary Coolant Pump & Bolt
Courtesy of GENERAL MOTORS CORP.

4. Remove the adapter plate plug (MM6 only).
5. Remove the auxiliary coolant pump bolt (2) (MY6 only).
6. Remove the auxiliary coolant pump (1) (MY6 only).

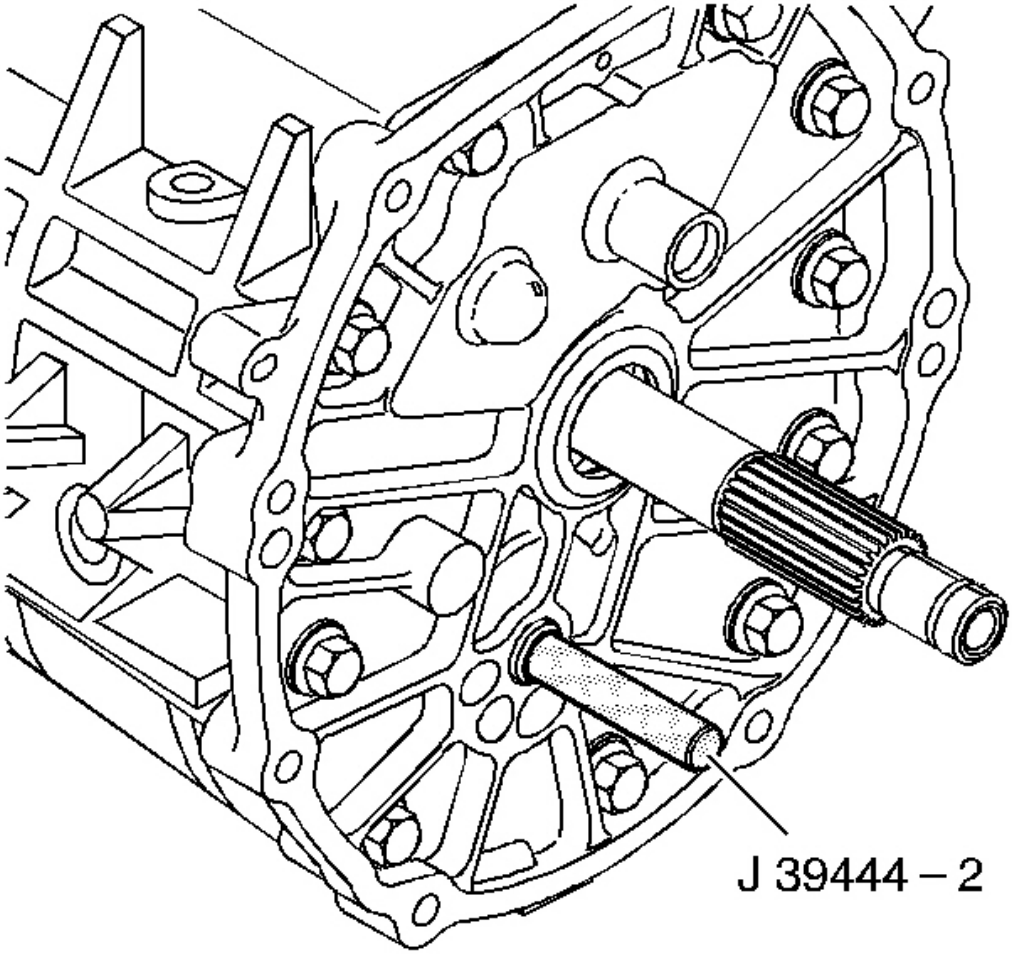


Fig. 407: View Of J 39444-2 In Adapter Plate Plug Hole
Courtesy of GENERAL MOTORS CORP.

7. Install the **J 39444-2** through the adapter plate plug hole. See **Special Tools**.
8. Screw **J 39444-2** into the countershaft extension. See **Special Tools**.

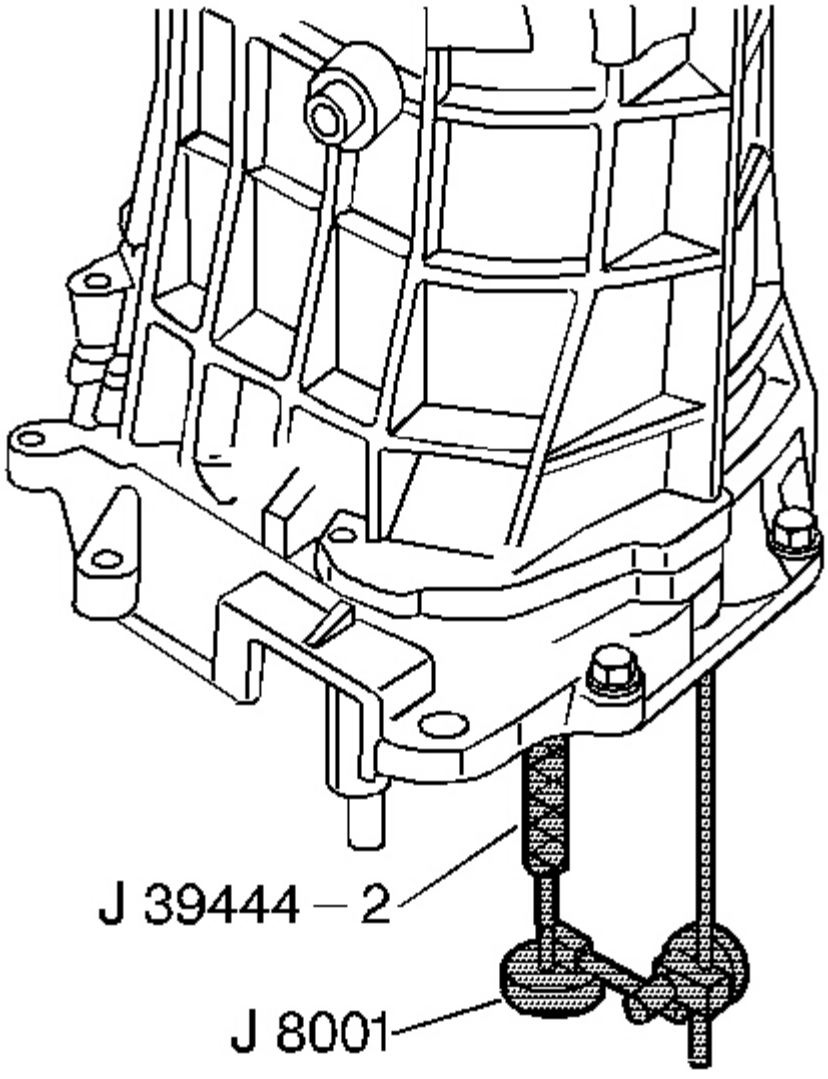


Fig. 408: Measure Countershaft Extension End Play Using J 8001 & J 39444-2
Courtesy of GENERAL MOTORS CORP.

9. Measure the countershaft extension end play using the following procedure:
    1. Install a **J 8001** so the tip is on the end of the countershaft extension end play rod.
    2. Rotate the transmission in the vertical position.
    3. Move the countershaft extension up and down using the **J 39444-2** . See **Special**

Tools.

4. Record the measurement.

10. Select a shim to achieve 0.05-0.13 mm (0.002-0.005 in) axial play.
11. Remove the **J 8001** .
12. Remove the **J 39444-2** . See **Special Tools**.

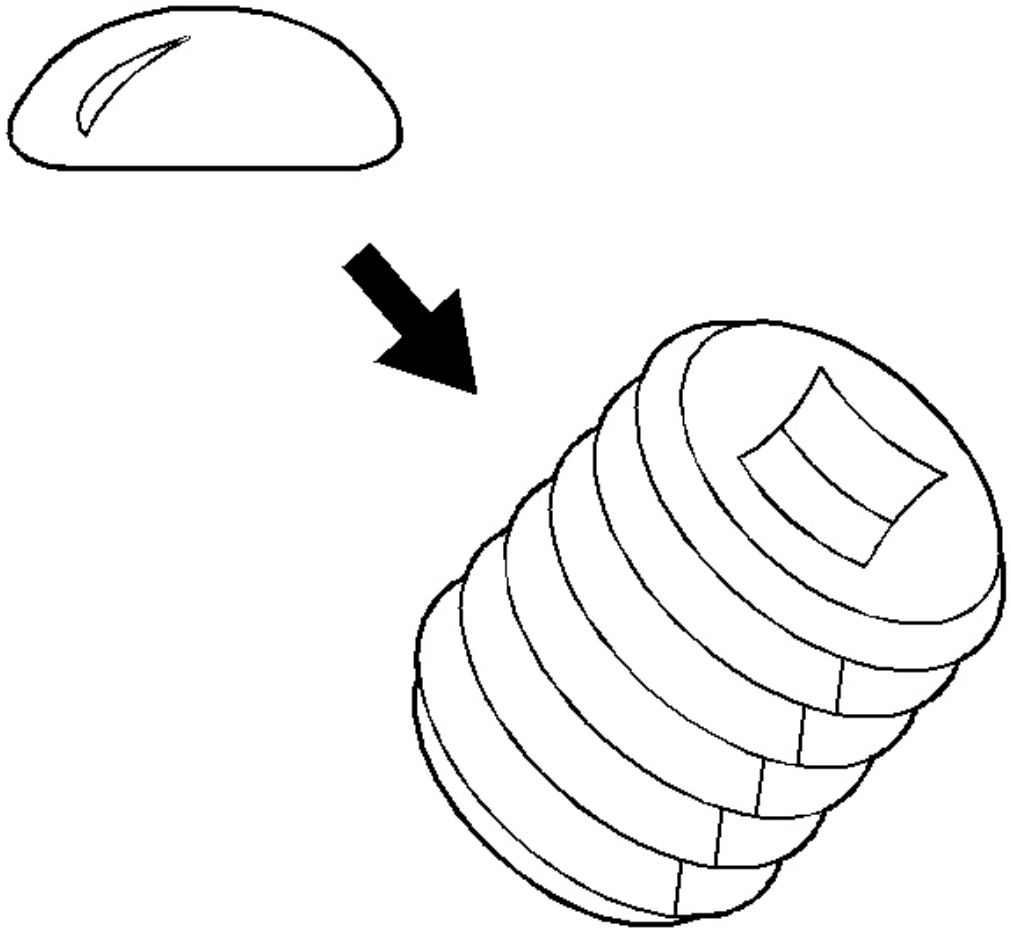


Fig. 409: Applying Sealant To Adapter Plate Plug Threads
Courtesy of GENERAL MOTORS CORP.

13. Apply sealant GM P/N 12346004, (Canadian P/N 10953480) or the equivalent to the plug threads.

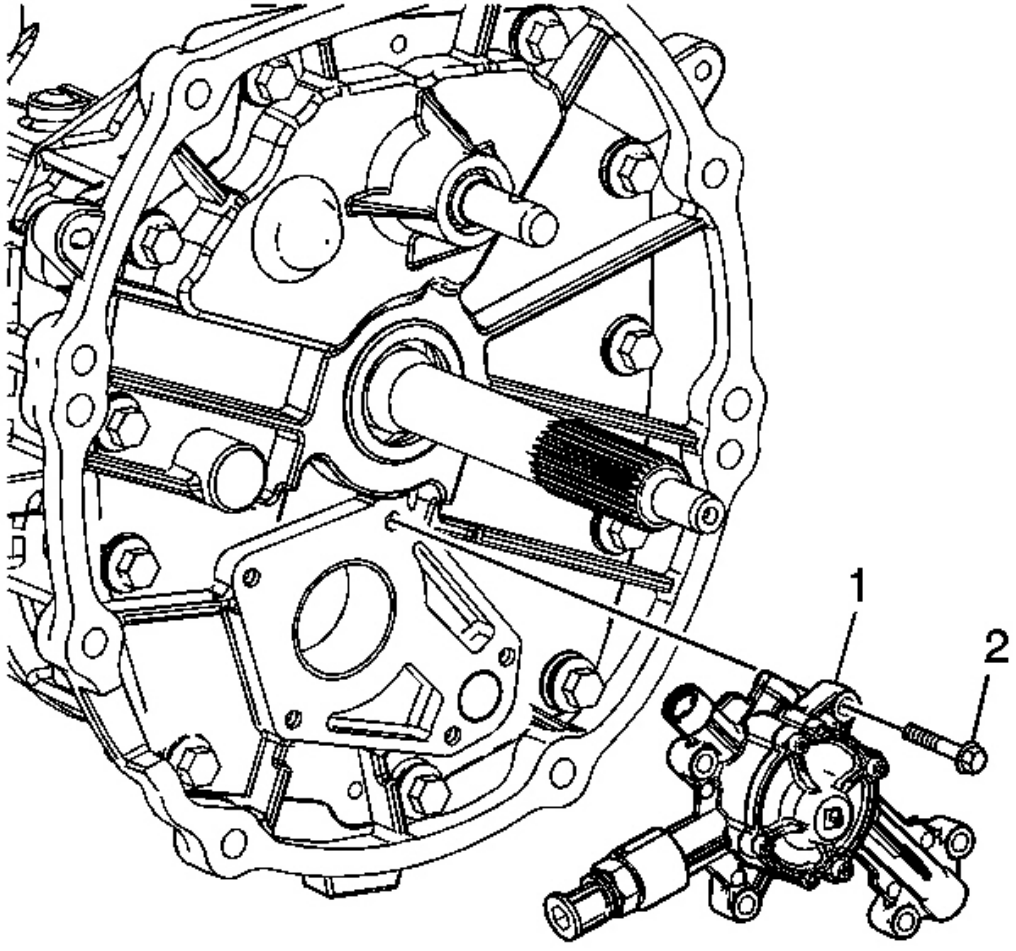


Fig. 410: View Of Auxiliary Coolant Pump & Bolt
Courtesy of GENERAL MOTORS CORP.

14. Install the adapter plate plug (MM6 only).

    Tighten: Tighten the plug to 27 N.m (20 Ib ft).

15. Install the auxiliary coolant pump (1) (MY6 only).
16. Install the auxiliary coolant pump bolt (2) (MY6 only).

    Tighten: Tighten the bolt to 19 N.m (14 lb ft).

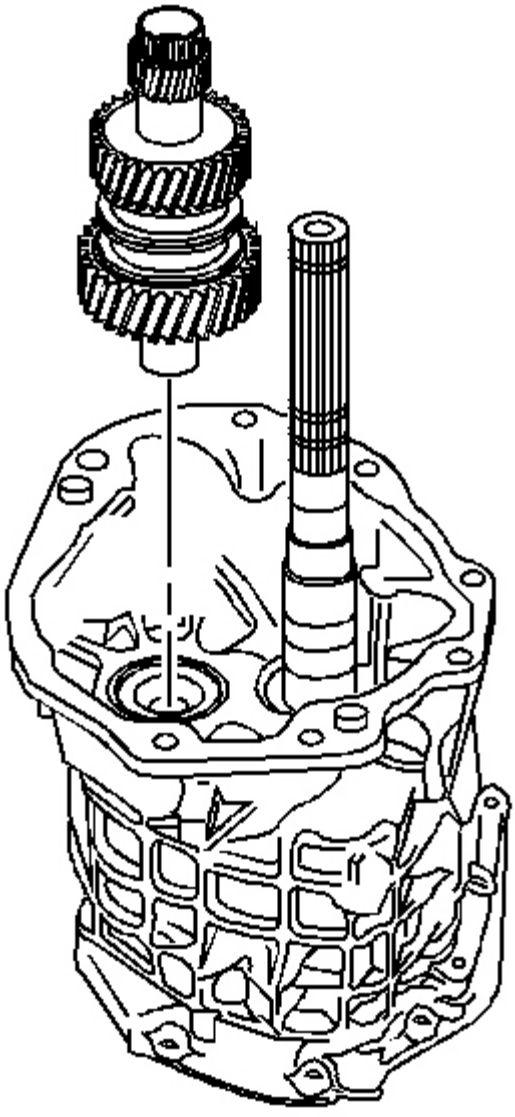


Fig. 411: Identifying Countershaft Extension
Courtesy of GENERAL MOTORS CORP.

17. Install the countershaft extension.
18. Install the countershaft extension bearing race.

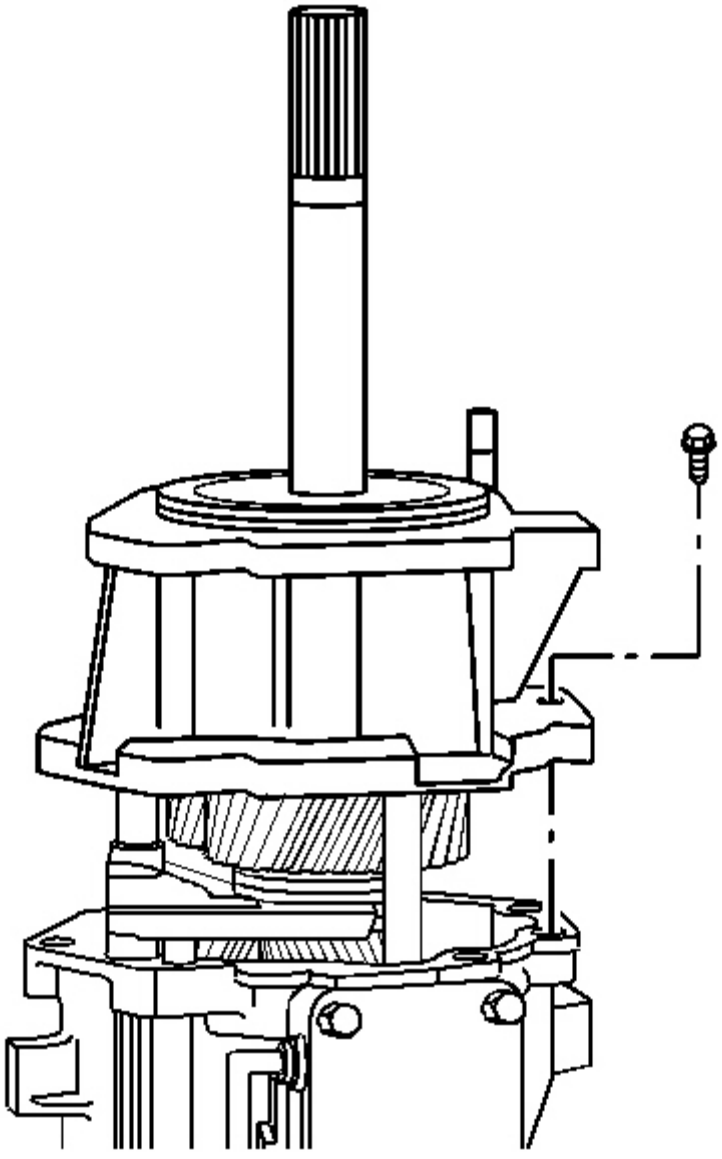


Fig. 412: View Of Extension Housing Bolts & Extension Housing
Courtesy of GENERAL MOTORS CORP.

19. Install the extension housing bolts and the extension housing.

DESCRIPTION AND OPERATION

MANUAL TRANSMISSION DESCRIPTION AND OPERATION

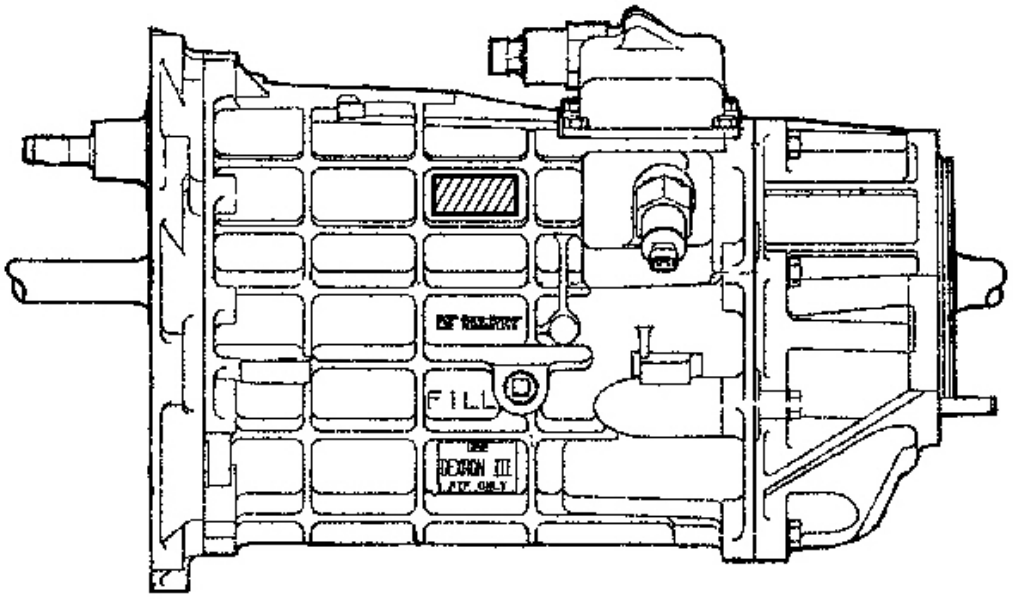


Fig. 413: Locating Borg Warner T-56 Manual Transmission VIN Derivative
Courtesy of GENERAL MOTORS CORP.

Manual transmissions are identified by the number of forward gears and the measured distance between the centerline of the output shaft and the counter gear.

The 6-speed manual transmission (RPO MM6/MZ6) incorporates the following features:

- An aluminum case
- Fully synchronized gearing with an enhanced synchronizer cone arrangement:
  - Triple-cone: FIRST, SECOND
  - Double-cone: THIRD, FOURTH, FIFTH, SIXTH
  - Single-cone: REVERSE
- An internal shift rail mechanism
- A remote transmission shift control mounted forward of the transmission
- An external transmission shift rod enabling the forward mount location of the transmission shift control

- An extended-length transmission output shaft mating directly to the rear axle drive pinion, in the rear of the differential housing
- Tapered roller bearings supporting the mainshaft and countershaft
- Caged roller bearings under all speed gears
- Solenoid inhibit of SECOND and THIRD gears
- Solenoid inhibit of REVERSE gear during predefined forward motion

These features combine to yield a rugged, reliable system capable of handling input torques of up to 610 N.m (450 lb ft) for the MM6 and 540 N.m (400 lb ft) for the MZ6.

The gear ratios are as follows:

Manual Transmission Description and Operation

Gear	MM6 Ratio (:1)	MZ6 Ratio (:1)
FIRST	2.66	2.97
SECOND	1.78	2.07
THIRD	1.30	1.43
FOURTH	1.00	1.00
FIFTH	0.74	0.71
SIXTH	0.50	0.57
REVERSE	2.90	3.28

Shift Control and Shift Rod

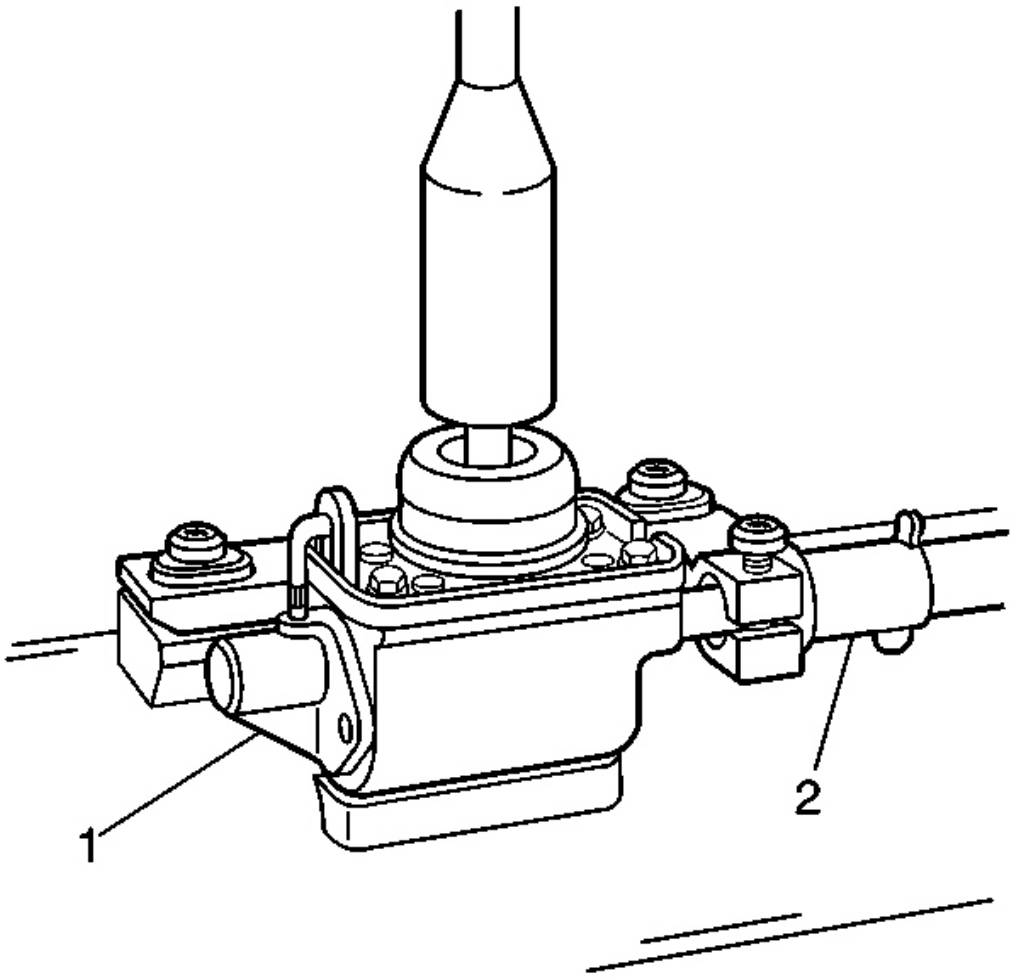


Fig. 414: Shift Control and Shift Rod
Courtesy of GENERAL MOTORS CORP.

To allow the rear-of-vehicle transmission location, the transmission shift shaft has been relocated to the front of the transmission. The shift shaft is connected to a transmission shift rod (2) which contains two sealed universal-style joints, enabling the range of motion necessary in order to shift gears. The shift rod (2) is connected to the transmission shift control (1) which is a lubricated and sealed unit, mounted to the driveline support assembly. The mounting system utilized for the shift control (1) incorporates rubber insulators. The cockpit of the vehicle is isolated from the driveline through the use of a shift control closeout boot which seals off the shift control and the driveline tunnel shift control opening.

Gear Select - Skip Shift

To ensure good fuel economy and compliance with federal fuel economy standards, SECOND and THIRD gears are inhibited when shifting out of FIRST gear under the following conditions:

- Coolant temperature is above 76°C (169°F).
- Vehicle speed is 24-31 km/h (15-19 mph).
- Throttle is opened 21 percent or less.

Reverse Lockout

A reverse lockout system, consisting of a reverse lockout solenoid which operates a reverse lockout mechanism, is utilized to prevent shifting into REVERSE gear when the vehicle is moving forward at a speed of 5 km/h (3 mph) or more.

REVERSE INHIBIT DESCRIPTION AND OPERATION

The reverse inhibit solenoid is a safety feature which prevents an inadvertent shift into reverse at speeds above 5 km/h (3 mph). The system consist of the following components:

- The powertrain control module (PCM).
- The reverse inhibit solenoid.

With the ignition ON, battery voltage is supplied directly to the reverse inhibit solenoid. At forward speeds above 5 km/h (3 mph) the PCM opens the control circuit of the reverse inhibit solenoid. This de-energizes the solenoid and mechanically blocks the shift lever from going into the REVERSE position.

SKIP SHIFT DESCRIPTION AND OPERATION

The skip shift solenoid is a performance feature which forces the driver to shift from first gear to fourth gear during light acceleration and low engine load conditions. This feature is used to ensure good fuel economy and compliance with federal economy standards. The skip shift system consist of the following components:

- The powertrain control module (PCM).
- The skip shift solenoid.
- The skip shift lamp.

With the ignition ON, battery voltage is supplied directly to the skip shift solenoid. The powertrain control module (PCM) controls the solenoid by grounding the control circuit. When

the skip shift system is active the PCM also grounds the control circuit of the skip shift lamp. The lamp illuminates to inform the driver that the 1-4 skip shift is engaged. The PCM determines when the skip shift system is active when the following parameters are met:

- The vehicle speed is between 24-31 km/h (15-19 mph).
- The engine coolant temperature (ECT) is greater than 77°C (171°F).
- The BARO is greater than 76 kPa.
- The accelerator pedal position (APP) is less than 26 percent.

When the conditions are met the powertrain control module (PCM) grounds the skip shift solenoid control circuit. This energizes the skip shift solenoid and mechanically blocks the gear shift lever from going into the second or third gear positions. When the drivers pulls back on the shift lever with the system enabled the transmission will go into fourth gear.

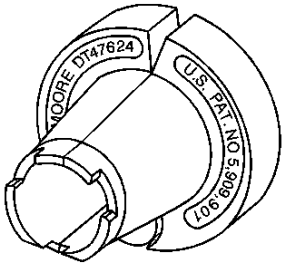
When the conditions for skip shift engagement are no longer met the powertrain control module (PCM) disables the skip shift solenoid, allowing the driver to use second and third gears.

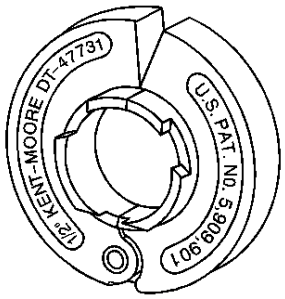
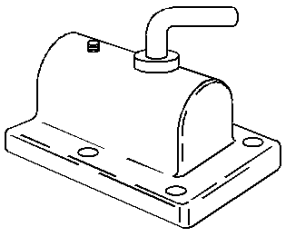
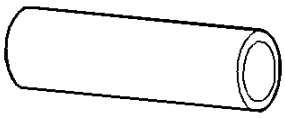
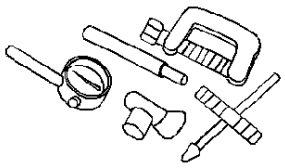
Once the skip shift solenoid is enabled the system will not be re-enabled until the vehicle speed returns to 0 km/h (0 mph) and the conditions for enabling skip shift solenoid are met.

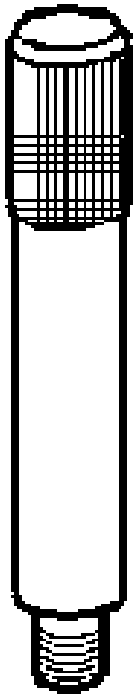
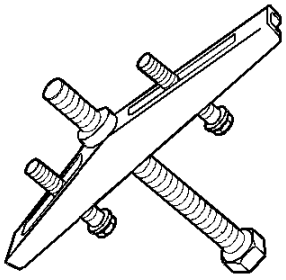
SPECIAL TOOLS AND EQUIPMENT

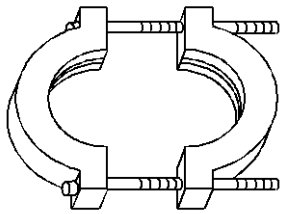
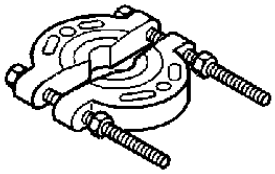
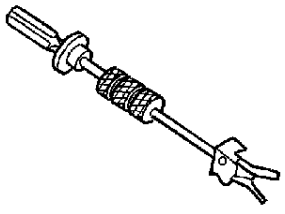
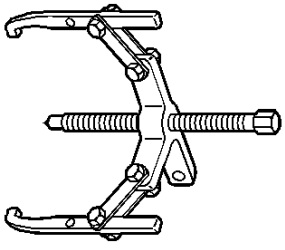
SPECIAL TOOLS

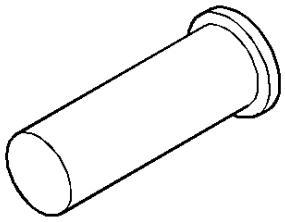
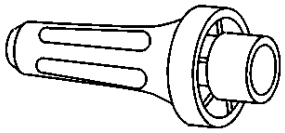
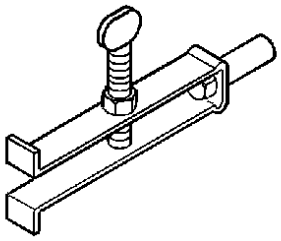
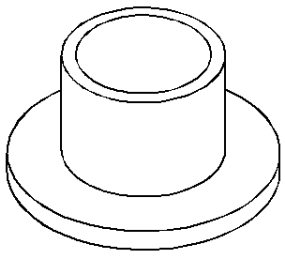
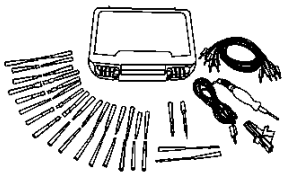
Special Tools

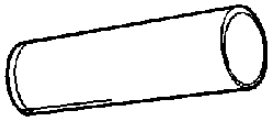
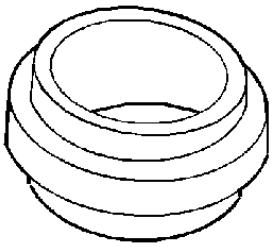
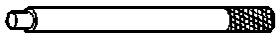
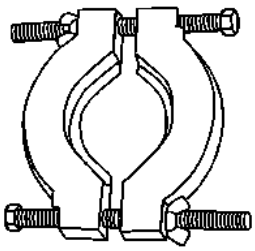
Illustration	Tool Number/ Description
	DT 47624 Transmission Cooler Line Release Tool

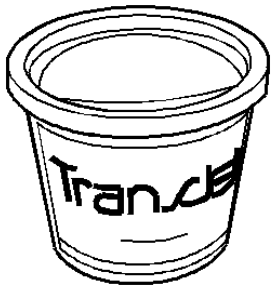
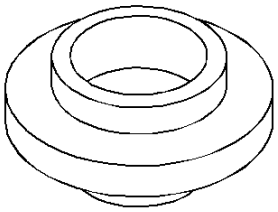
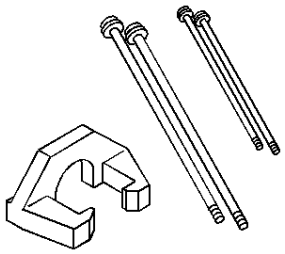
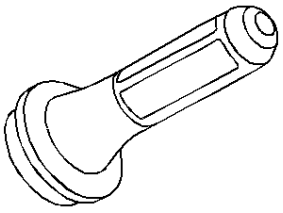
	DT 47731 1/2 Inch Quick Connect Release Tool
	J 3289-20 Holding Fixture
	J 5590 Press Tube
	J 8001 Dial Indicator Set

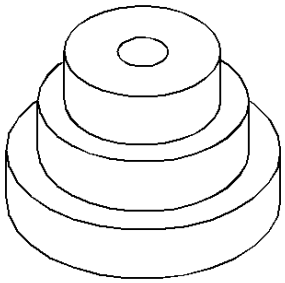
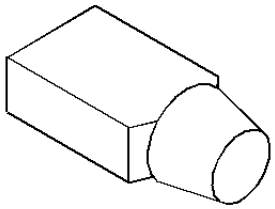
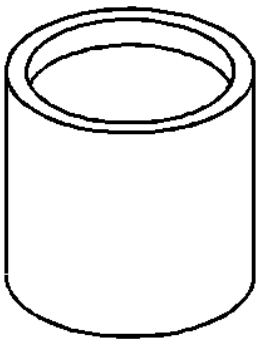
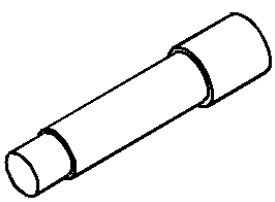
	J 8092 Universal Driver Handle
	J 8433 Universal Bridge Puller

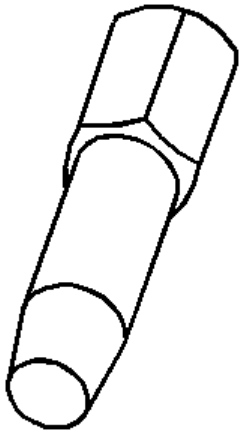
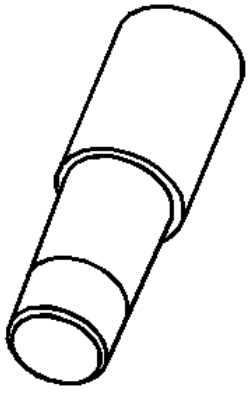
	J 22910-01 Split Plate
	J 22912-01 Split Plate
	J 23907 Slide Hammer
	J 25031 Three Jaw Puller
	J 25234 Press Tube

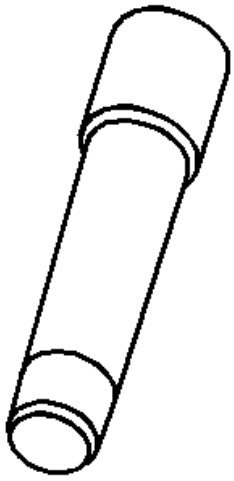
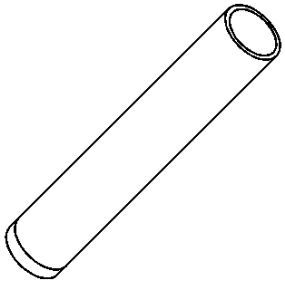
	
	J 26508-A Transmission Rear Seal Installer
	J 26941 Bearing Race Remover
	J 28537-17 Bearing Race Installer
	J 35616 GM-Approved Terminal Test Kit

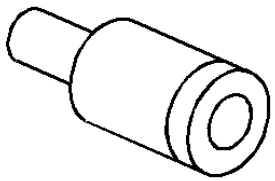
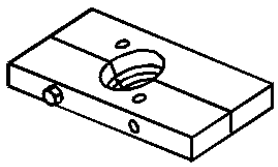
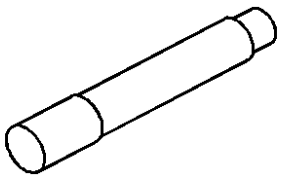
	J 36183 Press Tube
	J 36184 Press Tube Adapter
	J 36190 Universal Driver Handle
	J 36513 Split Plate
	J 36850 Transjel® Lubricant

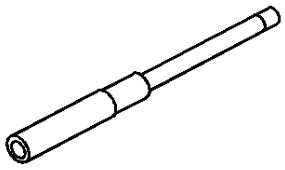
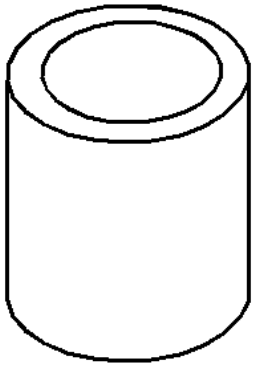
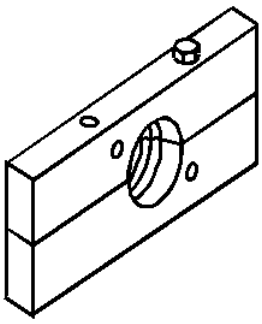
	
	J 39371 1st/2nd Synchronizer Installer
	J 39431-1, -2, -4 Gear Remover and Bolts
	J 39433 Input Shaft Seal Installer

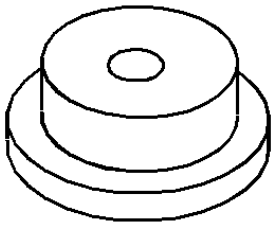
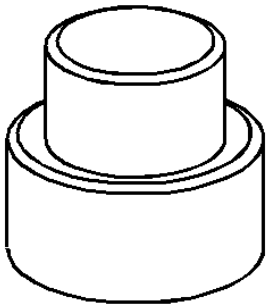
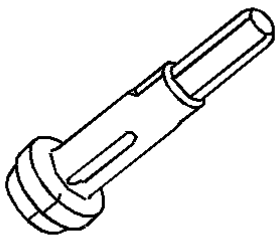
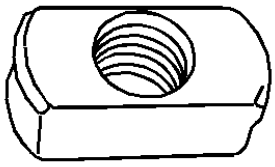
	J 39435 Bearing Race Installer
	J 39437 Bushing Installer
	J 39438 Bearing Installer
	J 39439-1 Shift Rail Bushing Remover/Installer

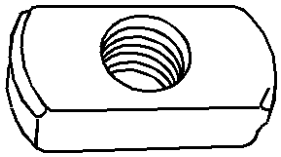
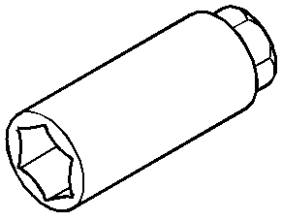
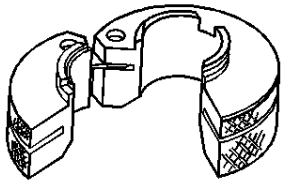
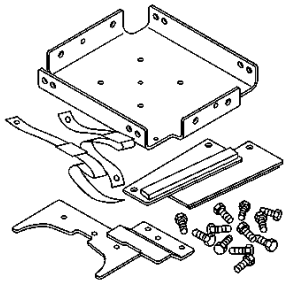
	J 39439-2 Bushing Remover
	J 39439-3 Bushing Installer
	J 39439-4 Bushing Installer

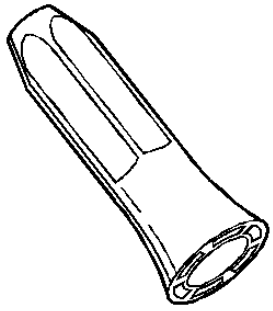
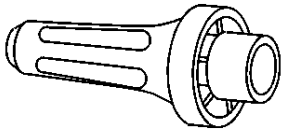
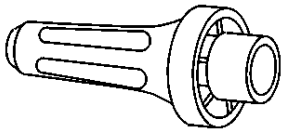
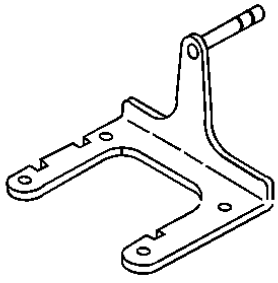
	
	J 39441 5th/6th Driven Gear Installer
	J 39441-10 5th Gear Installer Adapter

	J 39442 Press Adapter
	J 39443 Split Plate
	J 39444-1 Countershaft End Play Rod
	J 39444-2

	Countershaft Extension End Play Rod
	J 39473 Mainshaft Bearing Installer/Adapter
	J 39511 Split Plate
	J 39546 Bearing Race Installer

	
	J 39547 Press Adapter
	J 39594 Bearing Race Remover
	J 39790 Mainshaft Bearing Race Remover

	J 39791 Countershaft Bearing Race Remover
	J 41099 Skip Shift Sensor Remover/Installer
	J 41623-B Cooler Quick Connect Tool
	J 42055 Drivetrain Support Fixture
	J 42198 Transmission Rear Seal Installer

	
	J 42464 Shift Shaft Seal Installer
	J 42496 Inner Shift Rail Seal Installer
	J 44395 Transmission Holding Fixture